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ABSTRACT

This evaluation report describes the instructional utilization, teacher training, and implementation of Utah's Educational Technology Initiative (ETI) in school districts and colleges of education. Chapter 1 introduces the report and presents the evaluator's judgment about the steps needed to maximize the educational return on the financial investment represented by the ETI. Chapter 2 describes how elementary teachers actively involved in the ETI use computers in their instruction. Chapter 3 describes the ETI-related training these elementary teachers received. Chapters 4 and 5 focus on secondary teachers actively involved in the ETI; chapter 4 examines how the secondary teachers use technology in their instruction, and chapter 5 describes the ETI-related training these secondary teachers received. Chapter 6 describes the implementation of ETI projects at two colleges of education, Weber State University and Southern Utah University. Chapter 7 and 8 portray the implementation of ETI projects in two rural school districts, North Summit and Morgan. Many tables and graphs present the results. Copies of the teacher questionnaires are included. (MES)

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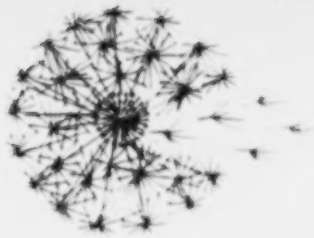

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Instructional Utilization, Teacher Training and Implementation of Utah's Educational Technology Initiative in School Districts and Colleges

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Report # ETI-2
June 1992

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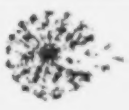

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Executive Summary - June 1992

This evaluation report was prepared by the Beryl Buck Institute for Education with funding from the Utah State Office of Education. We are indebted to the USOE Evaluation and Assessment Section for support and guidance throughout the conduct of this evaluation. The following report describes the instructional utilization, teacher training and implementation of Utah's Educational Technology Initiative in school districts and colleges of education. Utilization and training findings, based upon surveys completed by 960 elementary and 523 secondary teachers actively involved in the Educational Technology Initiative, are summarized below.

Teacher Computer Utilization

- In the three-year period from 1989-92, teachers actively involved in the Educational Technology Initiative doubled the amount of time they spent using technology for instructional purposes. Elementary teachers increased from an average of 1.3 hours per week to an average of 3.0 hours per week, and secondary school teachers increased their average use from 3.4 hours to 7.8 hours per week. At both levels of schooling, teachers in the higher grades reported using computers significantly more than in the lower grades.

- Elementary teachers actively involved in the Educational Technology Initiative use computers considerably more to support mathematics instruction than to support reading or writing. Secondary teachers actively involved in the Educational Technology Initiative use computers significantly more to teach writing than for reading or mathematics.

- Teachers' use of computers in different subject areas is strongly correlated with their belief about computer effectiveness.

- Microcomputers in labs or classroom settings are the most frequently used type of technology at both levels of schooling. Fewer than 20% of the

teachers actively involved in the Educational Technology Initiative use laserdiscs, scanners, or modems.

- The majority of instructional computer use by elementary teachers actively involved in the Educational Technology Initiative is in support of the Utah Core Curriculum. Over 80 percent of these elementary teachers use computers to instill basic skills through drill and practice. Sixty percent of these same teachers use computers for stimulating creative and higher order thinking. Fewer than 15 percent use the technology as a presentation or telecommunications medium.

- Over 70% of secondary school teachers actively involved in the Educational Technology Initiative report using computers for word processing. About 60% use computers for drill and practice, for the development of basic skills in the core curriculum and for developing higher order thinking skills. About one-third of these same teachers use technology as a presentation medium. Sixteen percent utilize computers for telecommunications.

Staff Development

- Approximately 45% of teachers actively involved in the Educational Technology Initiative received no inservice training to support the integration of technology with their instruction. A further 34% received less than 10 hours of inservice training.

- Although not all Utah teachers received ETI inservice training, the average teacher receiving training spent almost twice as much time in writing and mathematics inservice than in reading inservice.

- The average teacher receiving ETI inservice training rated that training as "effective" (3) on a scale running from "not effective" (1) to "extremely effective" (5).

- Most inservice training was provided by teachers and school district personnel. About 18% of training was provided by computer vendors. Only 3% of training was provided by local universities.

- Teachers receiving inservice were more likely to use computer technology more than teachers not receiving inservice. They were also more likely to use computers to stimulate higher order thinking and creativity.

In sum . . .

- ETI has made an important contribution to Utah education by making technology available to teachers and students. It appears, however, that the potential of this technology is not being attained. This is especially true at the elementary level. Utah teachers are using ETI technology in traditional ways. They are not using a wide variety of technological tools or experimenting with instructional presentation mediums.

- Universities do not appear to be providing the inservice support envisioned in the ETI legislation.

- ***The restricted use of technology by Utah teachers appears to be closely related to their lack of training. The majority of teachers received less than ten hours of technology training, and almost one-half received no training at all. Teachers receiving training were more likely to use computers in sophisticated ways and to increase their focus on higher order thinking skills and conceptual understanding. For the promise of ETI to be fulfilled, increased attention to staff development and teacher support is a necessity.***

Acknowledgements

This document is the product of the work and good will of a number of different individuals, and I would like to thank them for their contributions. Special thanks go to the Utah Educational Technology Initiative staff, Dr. Curtis Fawson, Project Director and Nedra Kissling and Vali Kramer, Administrative Assistants. Their help has been invaluable. In addition, district ETI Coordinators, school administrators and classroom teachers have given of their time, invited us into their schools, and completed our questionnaires. The deans and faculty of the colleges of education at Southern Utah University and Weber State University have welcomed us into their schools. Without the cooperation of all these individuals, the evaluation team would have little to report. We are grateful for their consistent willingness to sandwich our requests for information into already stretched and burdened schedules.

The members of the Beryl Buck Institute for Education evaluation team deserve particular recognition. Dr. Trish Stoddart, Assistant Professor of Educational Studies at the University of Utah, made major contributions to the design of this evaluation, conducted the case studies reported herein, and has been invaluable as field coordinator and liaison with Utah schools. Dr. Stoddart wrote initial drafts of Chapters 2-5 and 7-8. Dean Bradshaw and Carolyn Horan visited Southern Utah University and Weber State University and prepared the initial draft of Chapter 6. Dale Niederhauser supervised preparation of the data set and conducted the statistical analyses reported here. He also made major contributions to the preparation of Chapter 7. Without Marie Kanarr, this evaluation would be unreadable. Marie transcribed interviews, prepared graphics, tables and text, and made untold contributions to the evaluation team.

We are indebted to Richard Keene, Research Consultant, and the Utah State Office of Education Evaluation and Assessment Section for providing invaluable guidance throughout the conduct of this evaluation. We appreciate their knowledgeable support.

To all, thank you,

John R. Mergendoller
Novato, California - June 1992

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Chapter 1

Introduction, Overview and Conclusions

Introduction, Overview and Conclusions

This is the second evaluation report focusing on Utah's Educational Technology Initiative (ETI). It was prepared by the Beryl Buck Institute for Education with funding from the Utah State Office of Education. We are indebted to the USOE Evaluation and Assessment Section for support and guidance throughout the conduct of this evaluation.

An initial evaluation report, *A Portfolio-Based Evaluation of Utah's Educational Technology Initiative*, was issued in January 1992. It discussed the goals of the Educational Technology Initiative legislation and the funds made available to schools for technology purchases. The January 1992 evaluation report also analyzed school district ETI plans, and presented an in-depth case study of how one school district -- Salt Lake City -- responded to the Educational Technology Initiative. Finally, the January 1992 evaluation report examined the impact of ETI on the computers available in schools and on student learning.

The current evaluation report takes up where the January 1992 report left off and gives a more detailed portrait of the way computer technology is being used for instructional purposes by Utah's teachers, as well as the ETI-related training teachers had received. It also describes the ETI projects at two colleges of education and two rural school districts.

Overview

This report is organized in the following manner. Chapter 1 introduces the report and presents the evaluator's judgment about the steps needed to maximize the educational return on the large financial investment represented

by the Educational Technology Initiative. Chapter 2 describes how elementary teachers actively involved in the Educational Technology Initiative use computers in their instruction. Chapter 3 describes the ETI-related training these elementary teachers received. Chapters 4 and 5 focus on secondary teachers actively involved in the Educational Technology Initiative. Chapter 4 examines how the secondary teachers use technology in their instructions. Chapter 5 describes the ETI-related training these secondary teachers received. Chapter 6 describes the implementation of ETI projects at two colleges of education, Weber State University and Southern Utah University. Here we have used the portfolio metaphor to structure the chapters. We include assessment from administrators, professors and students regarding the impact of the ETI projects at each school. Chapter 7 and 8 portrays the implementation of ETI projects in two rural school districts, North Summit and Morgan. These case studies of small, rural school districts provide an interesting contrast to the case study of Salt Lake City School District, a large urban district described in the January 1992 evaluation report.

Each of the chapters that are not case studies end with concluding remarks. In addition, we have drawn together major themes discussed in the concluding section of these chapters in the following section entitled "Conclusions." This allows efficient access to the evaluators' conclusions for those readers who do not have the time to read the entire report.

Conclusions

The January 1992 evaluation report, *A Portfolio-Based Evaluation of Utah's Educational Technology Initiative*, ended with these words:

> Although ETI has accomplished a great deal by making the opportunity to use technology more available to students and teachers, it faces a significant challenge if it is to fully impact Utah education. This challenge is training teachers to use the newly available technology effectively. In our visits to schools, we encountered teachers exhibiting disparate levels of computer expertise. Some were quite competent; others were fearful and hesitant to touch a machine. For many adults, the computer is a frightening apparatus. Intensive training and time to experiment and discover what a computer is good for is necessary to overcome initial fears. ***If computer technology is to really make a difference in the instructional life of most teachers, then attention to teacher training and support is needed.***

These initial impressions, stemming from school visits and conversations with administrators and ETI project directors, have now been substantiated by the survey results discussed in Chapters 2 through 5. Although ETI has roughly doubled the number of computers available in schools, the majority of teachers are not exploiting the innovative instructional possibilities these machines make available. Recall that the teachers responding to the survey discussed in this report were actively involved in the Educational Technology Initiative. They represent those instructors most fluent in the use of computer technology. Yet, the elementary teachers among them appear to be using the hardware purchased with ETI funds in traditional ways. The secondary teachers are somewhat more venturesome in their use of educational technology, but they too appear to be somewhat limited in their classroom use of computers.

For computer technology to be used in instructional innovative ways, teachers must have both pedagogical and technological expertise. For most teachers, such expertise must be developed through training, through observing expert teachers and through the trial and error process of making their own classroom innovations and monitoring their impact on classroom process and student learning. As we have noted before, ***if computer technology is to really make a difference in the instructional life of most teachers, then attention to teacher***

training and support is needed. The teacher survey discussed in this report indicates that roughly 50 percent of Utah's teachers actively involved in the Educational Technology Initiative received no inservice training to help them integrate computer technology into their instruction and to expand their pedagogical skills. While some teachers are already experts and need little support, they are undoubtedly outnumbered by colleagues who could benefit from training. The results reported in Chapters 3 and 5 demonstrate that teachers who received inservice training are more likely to use computer technology in innovative and sophisticated ways.

With school budgets tight and many educational priorities to juggle, it is unquestionably difficult to find the money necessary to support an adequate program of professional development to complement the hardware already purchased with ETI funds. Unless this is done, however, much of the investment already made with ETI dollars will pay meager educational returns. ***We believe some portion of ETI funds should be earmarked for the training of elementary and secondary teachers.*** This should affect funding for both school districts and colleges of education. Utah's colleges of education, the elementary and secondary teachers responding to the surveys noted, have been notably absent in providing inservice training. By requiring a portion of the monies colleges of education receive to be used for inservice programs in neighboring school districts, this situation may be partially remedied.

Previous instructional innovations -- e.g., the new math, team teaching, activity-based science -- have a poor track records for bringing meaningful change and instructional improvement to classrooms. In part, this is because the innovators placed too much confidence in the power of their innovations, unassisted, to change long-standing instructional practices. Moreover, these innovators generally underestimated the amount of teacher training and support necessary to equip teachers and nurture their use of the new practices.

Without this training and support, however, classrooms did not change as the innovators had hoped. Instead, teachers co-opted the innovation and assimilated it into their previous ways of teaching. As the French have it: *plus ça change, plus c'est la même chose.*

The introduction of computer technology into school classrooms can be likened to the introduction of robotic machines into automobile production plants. With a minimum of training, operators can use these machines as simple lathes or drill presses. Such usage, however, ignores the tremendous flexibility and functionality of robotic machines. To exploit their potential, the workers operating them must be retrained and the factory around them must be redesigned. Introducing computer technology into the schools provides much the same challenges and possibilities. With minimal training, teachers can use computer technology as they would a worksheet or a typewriter. They can use computers as they previously used other rewards for students who finish their assignments early. Such strategies merely use the new electronic tools in place of the older mechanical ones. ***To exploit the potential computers offer, however, a significant program of teacher training and support is necessary.*** We believe implementing such a program is the next challenge of the Educational Technology Initiative.

Chapter 2

Technology Use in Utah Elementary Schools:

A Study of Teachers Actively Involved in the Educational Technology Initiative

Technology Use in Utah Elementary Schools:
A Study of Teachers Actively Involved in the Educational Technology Initiative

The Educational Technology Initiative (ETI) has made substantial amounts of technology available to Utah students and their teachers. The pivotal role of the teacher in guiding student technology use, and carrying out lessons that demand students to think in complex ways and understand the subtleties of subject matter, cannot be overemphasized. If technology is to be a natural part of students' instructional lives, their teachers must be competent technology users and incorporate it into their daily lessons.

This chapter considers computer use by Utah elementary teachers actively involved in the Educational Technology Initiative. It concludes with a summary of our findings.

Methodology, Limitations, and Statistical Notes

In October 1991, we distributed surveys to all 387 elementary schools receiving ETI funding. Copies of these surveys appear in Appendix A. We asked each school's principal to distribute surveys to two teachers in each of three grade groupings (K-2, 3-4 and 5-8) ***who were actively involved in the school's ETI project***. Overall, 960 elementary teachers returned their surveys (313 K-2 teachers, 329 3-4 teachers and 318 5-8 teachers). This represents an average of 2.5 teachers per school, an overall return rate of 82 percent.

All surveys from teachers in grades K-4 were included in the analysis. For grades 5-8, we only included teachers who taught in self-contained classrooms.

There are limitations to this sampling procedure, and the following results should be read with these limitations in mind. Although we surveyed all ETI schools and all grade levels, and the sample of elementary schools can be assumed to be representative of ETI schools in Utah, ***the sample of teachers within schools is probably biased towards more active computer users. Inferences should not be made from these data concerning the extent of computer use by teachers in general.*** The following results, however, should reflect the usage patterns and attitudes of elementary teachers who actively use computers in their instruction.

The following sections describe the results of this survey in words and graphs. Where appropriate, we have also conducted statistical tests to examine differences among groups. The nature and results of these tests are described in the endnotes following this chapter. In the text of this chapter, when the word "significant" is used, it means that a statistical test was performed on the data and differences were found to be statistically reliable at the .05 level or below.

Computer Use

We asked elementary teachers actively involved in the Educational Technology Initiative to report how many hours in a typical week they used computers for instructional purposes.[1] We focused on three time periods: 1989-90 (before ETI), 1990-91 (the first year of ETI), and 1991-92 (the second year of ETI). Elementary teachers reported using computers in their teaching significantly more hours per week in 1991-92 than they did before the initiation of ETI. In fact, the number of hours of technology use increased significantly from 1989-90 to 1990-91 and increased significantly again from 1990-91 to 1991-92.[2]

As is shown in Figure 2.1, these teachers reported using technology for an average of 1.26 hours a week in 1989-90, for an average of 2.13 hours a week in 1990-91 and for an average of 2.99 hours per week in 1991-92.

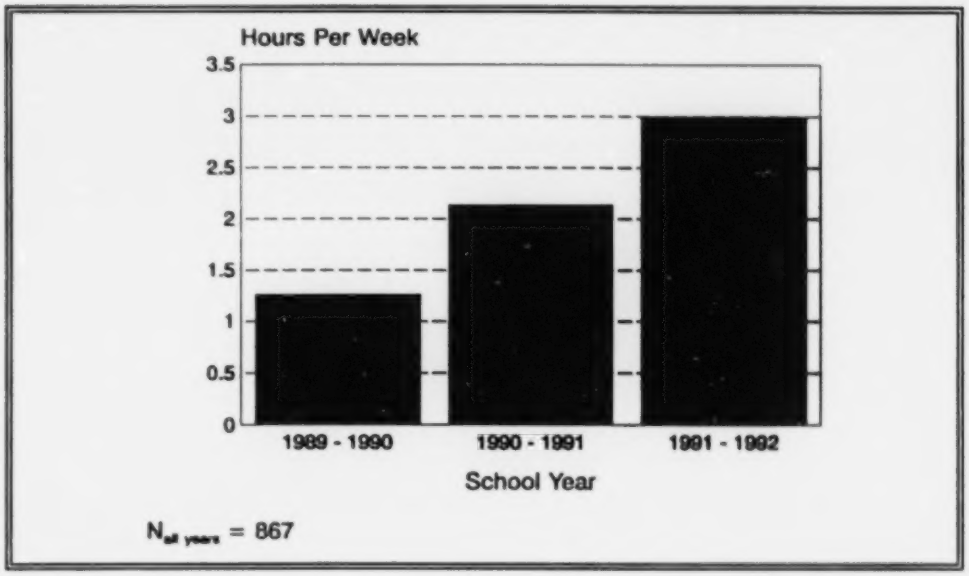

Figure 2.1: Computer Use by Elementary Teachers Actively Involved in the Educational Technology Initiative

According to these teachers' estimates, between 1989 and 1992, the amount of instructional time spent using computers more than doubled in Utah elementary schools. This increase parallels the increase in the number of computers available. During the same period, the number of computers available for student use in the elementary grades more than doubled, from 5,308 to 10,786, and the student-computer ratio was cut in half, decreasing from 1 computer for 27 students to 1 computer for every 11 students (Mergendoller, Stoddart, Bradshaw & Niederhauser, 1992). Teachers thus appear to be utilizing the computers made available to them.

Grade Level Differences in Computer Use

Although the use of technology for instructional purposes increased significantly between 1989 and 1992 at all elementary grade levels, teachers in grades 5 to 8 used computers more frequently than teachers in lower grade levels. This is displayed on Figure 2.2.[3]

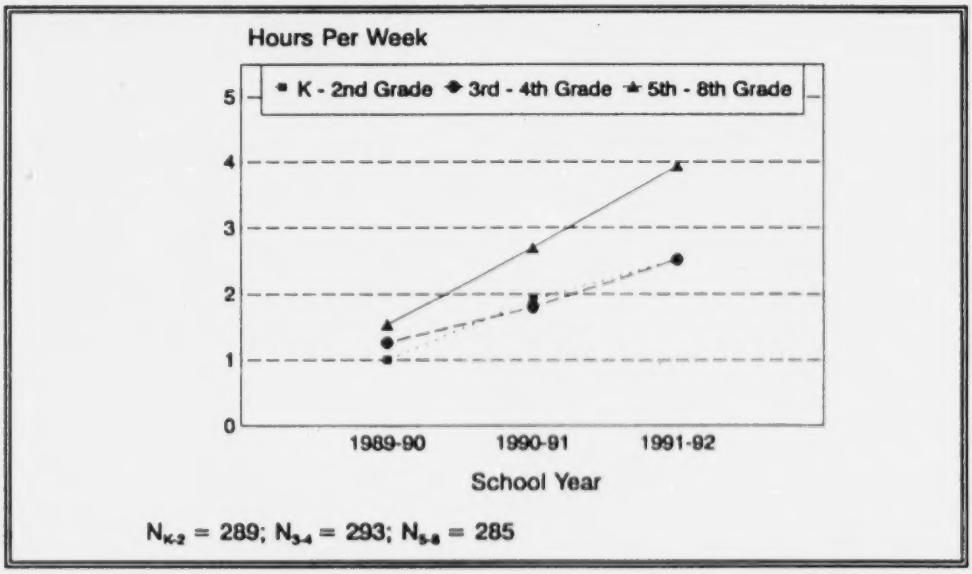

Figure 2.2: Computer Use by Elementary Teachers Actively Involved in the Educational Technology Initiative by Grade Level

Over the three-year period from 1989 to 1992, teachers in grades 5-8 began to spend increasingly more instructional hours using technology than teachers in grades K-4. In 1989-90, there were no significant differences in technology use among K-8 teachers. In 1990-91, however, grade 5-8 teachers used technology significantly more often than did grade K-2 and grade 3-4 teachers, and in the 1991-92 school year the gap between use in grades 5-8 and use in grades K-4 widened even more.[4] These results confirm the perceptions of elementary

principals reported in the initial ETI Evaluation report (Mergendoller, *et al.*, 1992).

The data collected from elementary teachers actively involved in the Educational Technology Initiative does not suggest why upper elementary teachers use technology more than lower elementary teachers, but similar findings were reported in a Florida study (Milton, Herrington, Arthur & Owens, 1989). This disparity in use may be caused by a variety of factors including access to computers, student developmental levels, grade level curriculum objectives, availability of software and teacher expertise.

Computer Use in Different Subjects

Elementary teachers actively involved in the Educational Technology Initiative use computers most frequently for mathematics instruction (74%) followed by reading instruction (49%) and writing instruction (42%).[5] These results are displayed on Figure 2.3.

There are differences in subject area use patterns at different grade levels.[6] These are displayed on Figure 2.4. In grades K-2, significantly more teachers report using the computer for reading than for writing. In grades 3-4 there are no significant differences between the number of teachers using computers for reading or for writing. Significantly more teachers in grades 5-8 report they are using the computer more for writing than for reading. More teachers at all grade levels use computers most frequently for mathematics instruction.

Finally, lower elementary teachers report using computers significantly more to teach reading and mathematics than upper elementary teachers.

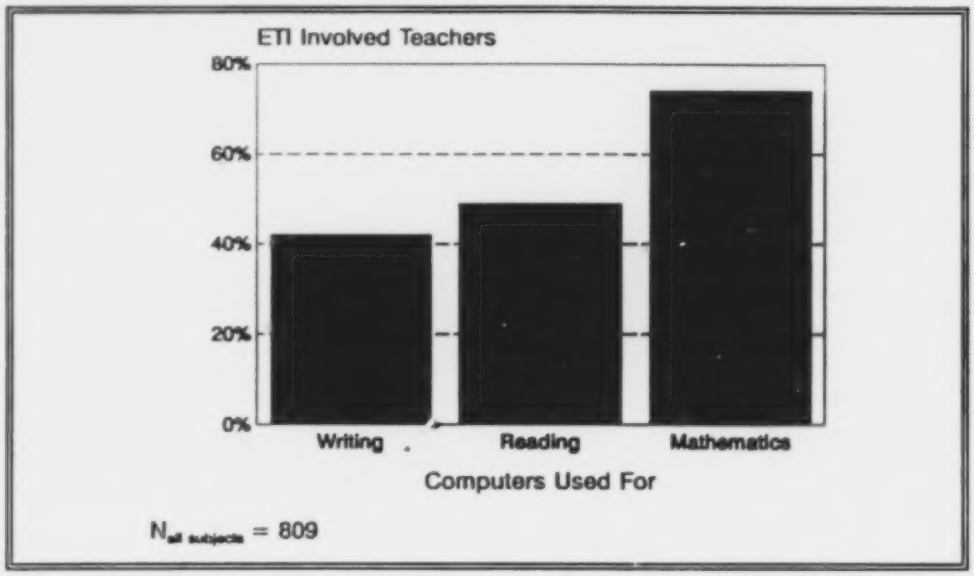

Figure 2.3: Computer Use by Elementary Teachers Actively Involved in the Educational Technology Initiative by Subject

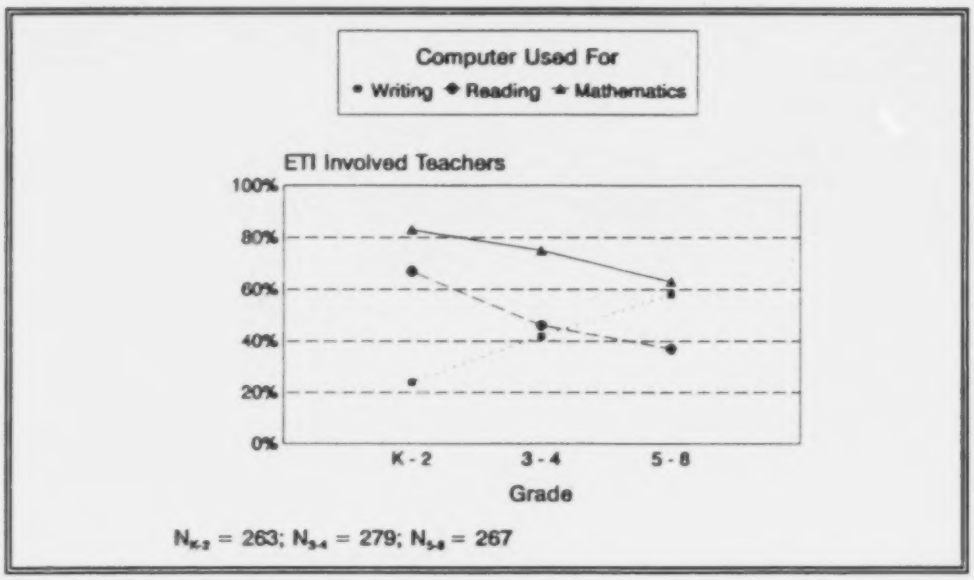

Figure 2.4: Computer Use by Elementary Teachers Actively Involved in the Educational Technology Initiative by Grade Level

These findings indicate that lower elementary users emphasize using the computer to establish primary skills in reading and mathematics, while upper elementary users use the technology more as a tool for writing. These results may reflect different curriculum demands at different grade levels. For example, fifth-sixth grade students typically spend more time writing reports in different subject areas than lower grade students. But the findings also indicate that teachers are using computers to fit in with traditional practice rather than using them in experimental ways. For example, computer programs can be used with K-2 students to establish literacy skills through writing activities.

The Effectiveness of Using Computers in Instruction

Elementary teachers actively involved in the Educational Technology Initiative believe computers can be used most effectively for mathematics instruction ($\bar{x}$ = 4.28), followed by writing instruction ($\bar{x}$ = 3.93), and are least effective for reading instruction ($\bar{x}$ = 3.64).[7] These subject matter differences are statistically significant and are displayed in Figure 2.5.[8]

These are, however, grade-level differences in elementary teachers' assessments of the effectiveness of computer-supported instruction.[9] These results are shown in Figure 2.6.

Upper elementary computer users rated computer-supported instruction as significantly more effective for writing than those in the lower grades. In contrast, computer users in grades K-2 viewed computer-assisted reading instruction as more effective than those in grades 3-4, and grades 5-8. Computer users at all grade levels believed computers could be very effective in teaching mathematics.

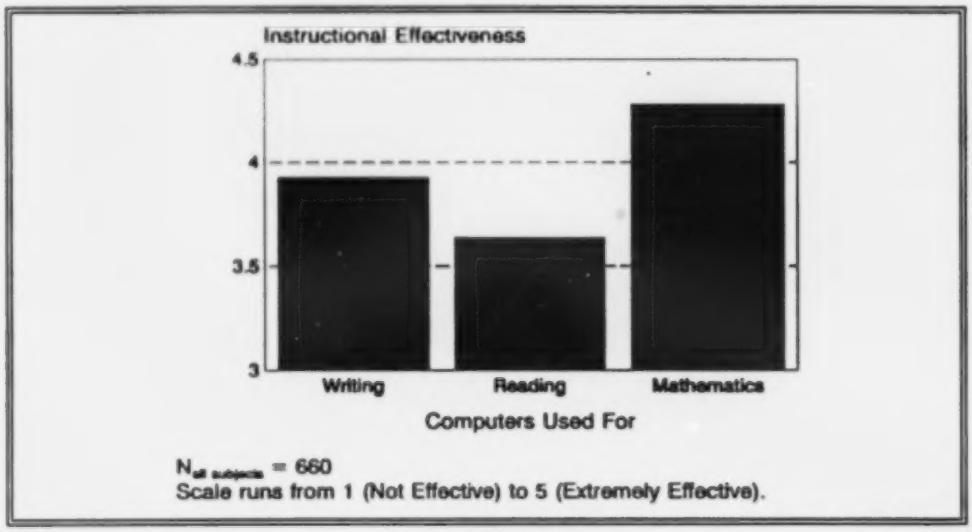

Figure 2.5: Perceptions of the Instructional Effectiveness of Computers by Elementary Teachers Actively Involved in the Educational Technology Initiative

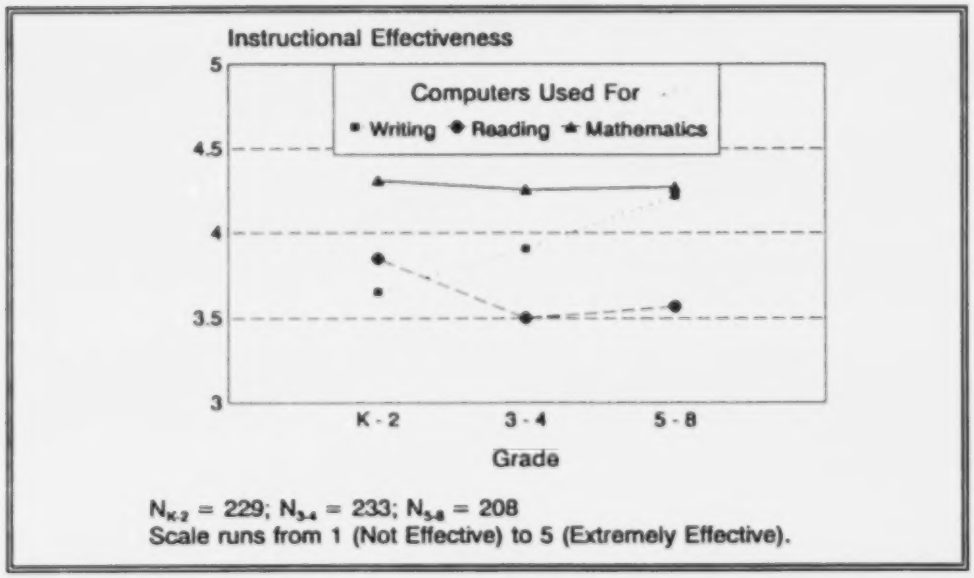

Figure 2.6: Perceptions of the Instructional Effectiveness of Computers by Elementary Teachers Actively Involved in the Educational Technology Initiative by Subject and Grade Level

These findings may also suggest a powerful relationship between teachers' beliefs and their practices (Clark and Peterson, 1986). It appears Utah elementary teachers who are active computer users are using computers in the ways they currently ***believe*** to be the most effective. Changing these use patterns will require staff development that expands teachers' understanding of the variety of ways computers can be employed in teaching reading, writing and mathematics.

Beyond the Computer Lab

We asked teachers actively involved in the Educational Technology Initiative whether they used computers in their classrooms or in a computer lab. The results are reported in Figure 2.7.

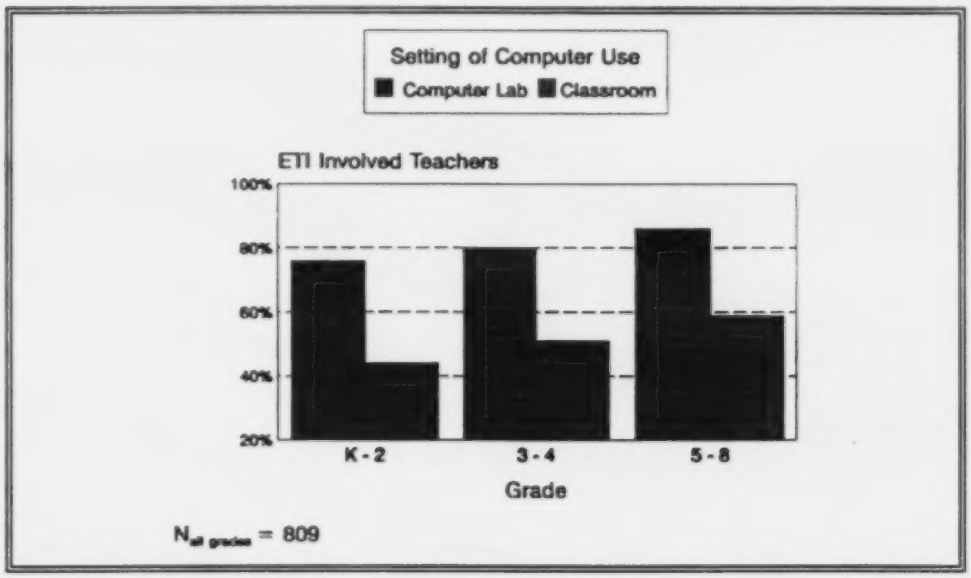

Figure 2.7: Use of Computers in Lab and Classroom Settings by Elementary Teachers Actively Involved in the Educational Technology Initiative

As would be expected, lab-based computers are the most frequently used type of technology: 81 percent of elementary teachers actively involved in the Educational Technology Initiative report using computers in a lab setting. Fewer teachers report using computers in their own classrooms for instructional purposes.

Similarly, more upper elementary teachers use computers in both lab and classroom settings than teachers in grades K-4. This finding is explained by the fact that upper elementary teachers use computers more than those in the lower elementary grades (see Figure 2.2).

Computers, however, can be used in a wide variety of ways. Teachers and students can use technology to communicate with other users in their own schools and users locally, nationally and internationally through networked communication systems. For example, it is possible through satellite hookups for Utah students to publish newspapers and share information with students in Europe and use a national information database to assemble information for a written report or class project. Only 27 percent of Utah elementary teachers actively involved in the Educational Technology Initiative, however, report using computers for network communications and even fewer (16%) use laserdisc technology. A very small percentage utilize modems (3%) or scanners (12%). These results are displayed on Figure 2.8.

There are significant differences in equipment use by grade level.[10] The upper elementary users, however, not only use technology more often, they use it in a greater variety of ways. As Figure 2.9 demonstrates, upper elementary users are significantly more likely to use technology presentation mediums, such as laserdisc players, or scanners and fileservers than lower grade users.[11] This disparity in use across grade levels could be a function of differences in grade level objectives, availability of equipment or teacher expertise.

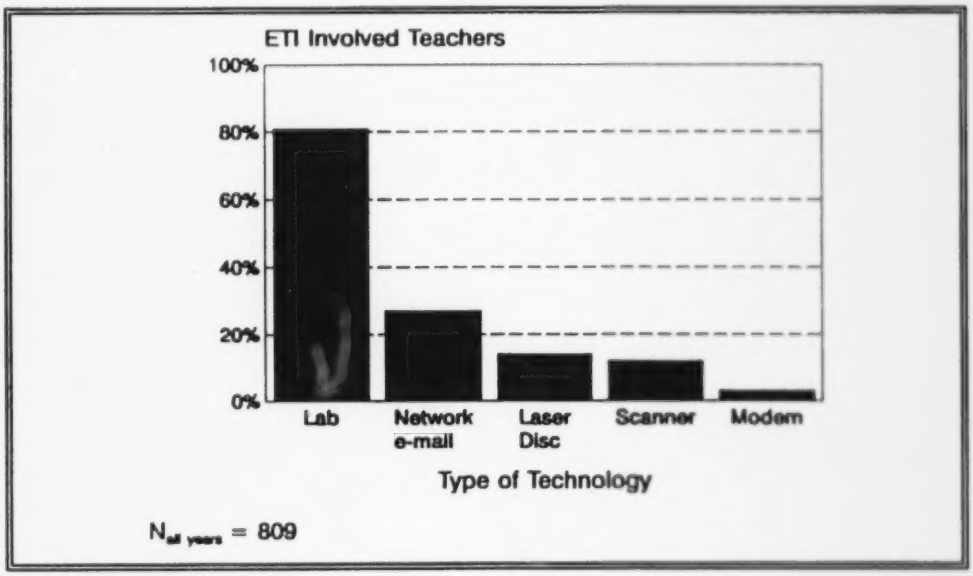

Figure 2.8: Percent of Elementary Teachers Actively Involved in the Educational Technology Initiative Using Different Types of Technology

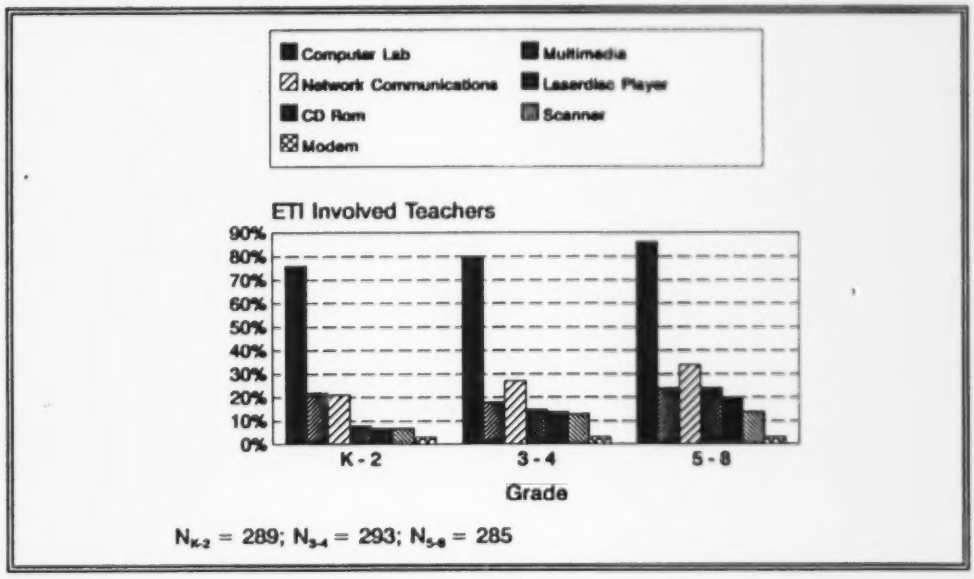

Figure 2.9: Percent of Elementary Teachers Actively Involved in the Educational Technology Initiative Using Different Types of Technology by Grade Level

Instructional Uses

The percent of Utah elementary teachers actively involved in the Educational Technology Initiative using computers for different purposes is displayed on Figure 2.10.

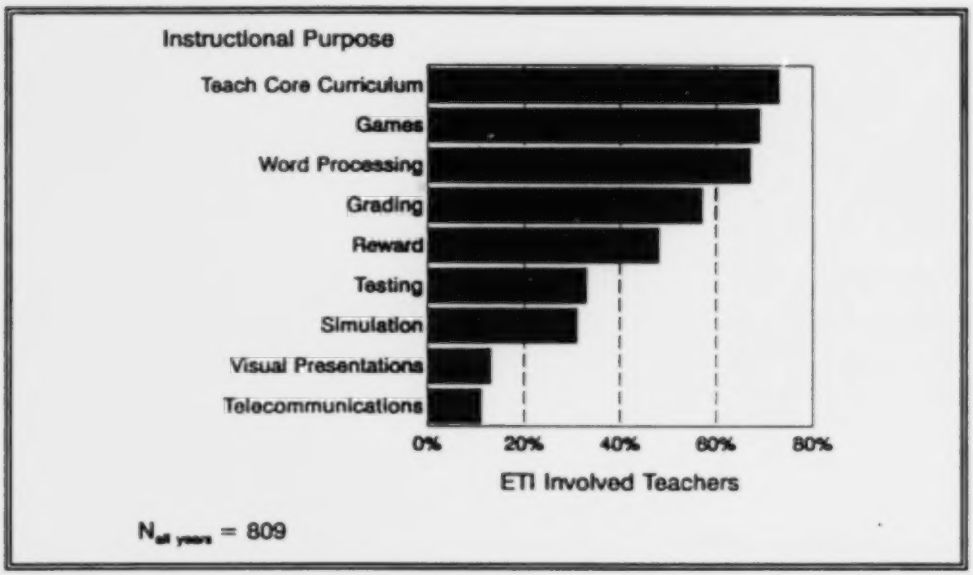

Figure 2.10: Percent of Elementary Teachers Actively Involved in the Educational Technology Initiative Using Computers for Different Instructional Purposes

Although the predominant instructional purposes are those of teaching the Utah Core Curriculum, playing games and word processing, a majority of the elementary teachers (57%) also used computers for grading and record-keeping. Roughly one-half of these respondents reported using computers as a reward for students, and approximately 30 percent reported using computers for student testing, or to simulate real-world situations. Only about one elementary computer user in ten uses the technology to make presentations to the class or for telecommunications.

There are significant differences in the numbers of teachers at different grade levels using computers for different instructional purposes.[12] In general, more teachers at higher grade levels use computers for word processing, grading and record-keeping, testing, and for simulations.[13] Interestingly, more teachers in grades 3 and 4 use the computer for a reward compared to teachers in either the lower- or upper-elementary grades. This can be seen on Figure 2.11.

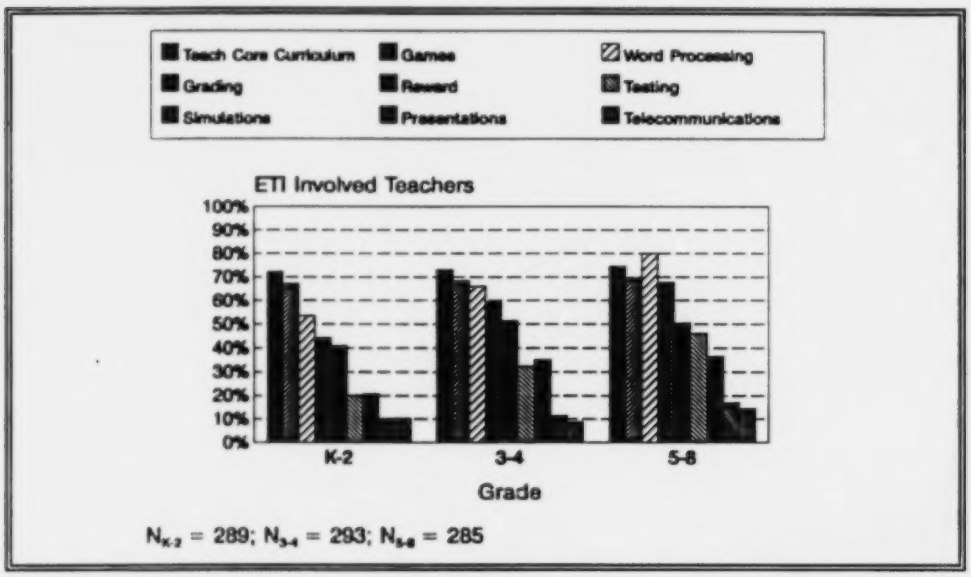

Figure 2.11: Percent of Elementary Teachers Actively Involved in the Educational Technology Initiative Using Computers for Different Instructional Purposes by Grade Level

The introduction of technology into the public schools has been viewed as an important tool for restructuring education and changing the ways teachers teach (Gifford, 1986). Previous research, however, indicates that teachers typically appropriate technology to support existing practice, using technology primarily for drill and practice in basic skills (Bork, 1980; Cole and Griffin,

1987; Gradolf, 1988). Utah elementary computer users conform to this national trend, as noted on Figure 2.12.

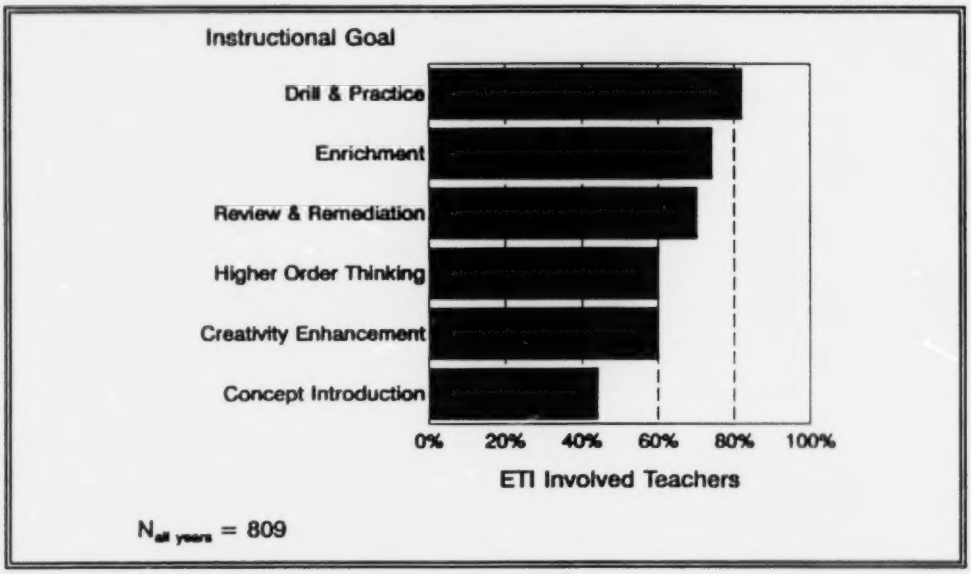

Figure 2.12: Percent of Elementary Teachers Actively Involved in the Educational Technology Initiative Using Computers for Different Instructional Goals

The majority of users (82%) report using computers for drill and practice, for enrichment (74%) or for review and remediation (70%). Fewer use computers to develop higher order thinking skills (60%), enhance creativity (60%) or present new concepts (44%). These findings suggest that the majority of elementary teachers actively involved in the Educational Technology Initiative support their basic skills instruction by using the computer.

Once again the data reveal a disparity among elementary teachers at different grade levels.[14] As Figure 2.13 shows, a significantly higher percentage of teachers in grades 5-8 use computers to develop higher order thinking skills, enhance creativity and introduce new concepts compared to lower elementary

teachers. These upper elementary teachers are also more likely to use the technology for word processing, testing, and record-keeping.

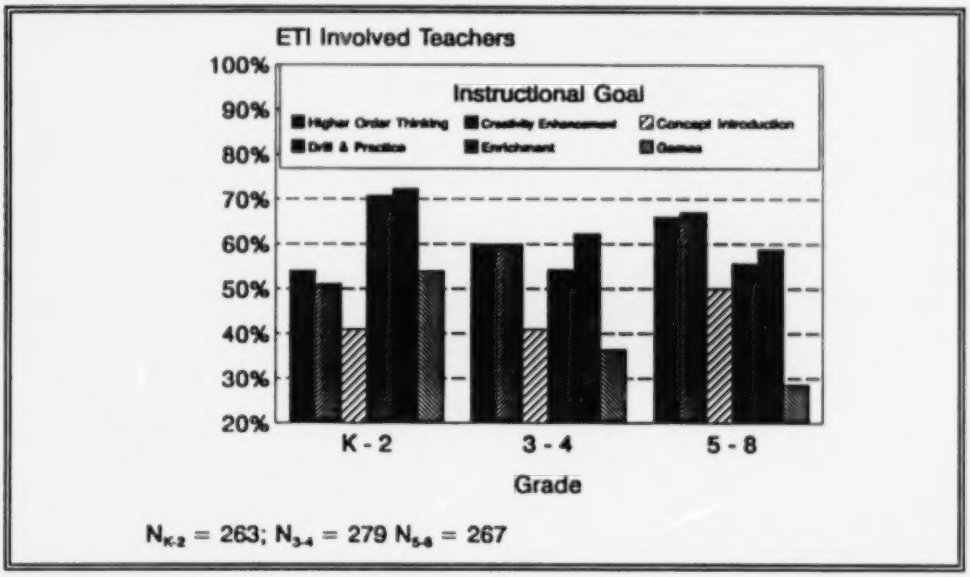

Figure 2.13: Percent of Elementary Teachers Actively Involved in the Educational Technology Initiative Using Computers for Different Instructional Goals by Grade Level

Summary and Discussion:
Technology Use in Utah Elementary Schools

The following points summarize our findings about how elementary teachers actively involved in the Utah Educational Technology Initiative have integrated technology into their instructional practices:

- From the 1987-90 school year to the 1991-92 school year, elementary teachers who were active computer users more than doubled the amount of time they used technology for instructional purposes from an average of 1.26 hours per week to an average of 2.99 hours per week. Teachers in grades 5-8 increased their usage significantly more than other elementary teachers;

- Elementary computer users use the technology considerably more to support mathematics instruction than to support reading or writing. As the grade level increases, larger proportions of elementary users employ computers during writing instruction. At the same time, lesser proportions of upper elementary teachers use computers for reading and mathematics instruction;

- Elementary computer users' beliefs about the instructional effectiveness of computers in different subject areas generally parallel their usage patterns. Computers are seen as most effective for mathematics instruction, and increasingly effective for writing instruction as grade level increases;

- The computer lab is the most frequently used type of technology among elementary computer users. Fewer than 20% of these teachers use laserdiscs, scanners, or modems;

- Over 80 percent of elementary computer users utilize the technology to instill basic skills through drill and practice. Sixty percent of these same users utilize computers for stimulating creative and higher order thinking; and

- The majority of instructional computer use by elementary teachers actively involved in ETI is in support of the Utah Core Curriculum. Fewer than 15 percent of these users employ the technology as a presentation or telecommunications medium.

It is important to remember that these results reflect the experience of the Utah elementary teachers most involved with educational technology. It is these teachers who would have the best chance to use computers in innovative ways. The fact that relatively few of them are using computers to communicate with teachers and students in other states and lands, or to present new concepts using sound, images, and text, suggests that the instructional potential of computer technology purchased with ETI dollars is still to be realized.

Of particular concern is the dominant use of computers for drill and practice in mathematics and reading in the early grades and the lack of emphasis on computer-assisted writing. Only about half of K-2 computer users report using computers to teach higher order thinking skills or to enhance creativity. This runs counter to current national policy, particularly in mathematics education, where reformers are advocating a much greater emphasis on the development of students' conceptual understanding through problem-solving, concrete activities, and integration of mathematical concepts across subject areas (National Council of Teachers of Mathematics, 1989).

Elementary teachers are assimilating technology into their current ways of teaching. They do not appear to be using computer technology to expand and

change their instructional goals and practices. Such changes, however, require more than the availability of hardware. They require training in technology and *curriculum*. In addition, teachers need to see examples of other teachers using technology in innovative ways.

The next chapter explores the training made available to elementary computer users.

Endnotes

1 To examine differences in the amount of time teachers were using computers with students, a 3 x 3 Analysis of Variance (ANOVA) was performed. Grade Level (K-2, 3-4 and 5-8) was used as a between subjects factor and years (1989-90, 1990-91 and 1991-92) was a subject factor. The dependent measure was the number of hours per week a teacher reported using computers for instructional purposes. The wide range of hours of use reported by teachers contributes to the relatively high standard deviations and ms, terms.

2 A main effect was found for Years, F (2, 1728) = 89.31, p <.001, ms, = 7.26. This result indicates that the number of hours per week which teachers typically used computers for instructional purposes increased significantly from 1989 to 1992. Teachers typically used computers for an average of 1.26 hours in 1989-90 (SD = 3.25), 2.13 hours in 1990-91 (SD = 4.48) and 2.99 hours in 1991-92 (SD = 5.21). Student-Newman-Keuls post-hoc analysis showed significant differences between 1989-90 and 1990-91 (p <.01) and between 1990-91 and 1991-92 (p < .01).

3 A main effect was found for Grade Level F (2, 864) = 4.96, p <.01, ms, = 45.10. This result indicates that the number of hours per week which teacher typically used computers for instructional purposes in grades K-2 (M = 1.81, SD = 4.10) and 3-4 (M = 1.86, SD = 3.55) was lower than that of the grade 5-8 (M = 2.72, SD = 5.30) teachers. Subsequent Student-Newman-Keuls post-hock analyses did not show significant differences among the three groups.

4 The Grade Level X Years interaction reached significance, F(4, 1728) = 3.83, p <.01, ms, = 7.26. This result indicates that usage increased differentially based on grade level (see means table below). Student-Newman-Keuls post-hoc analysis revealed no differences between grade levels were found for the 1989-90 school year; however, during the 1990-91 school year, grade 5-8 teachers reported using computers for more hours than the K-2 teachers (p <.05) and the 3-4 teachers (p <.01). By the 1991-92 school year, grade 5-8 teachers had increased the gains of previous years and continued to use computers for significantly more hours than both K-2 and 3-4 teachers (p <.01).

The Student-Newman-Keuls post-hoc analysis also showed significant increases for the 5-6 group from 1989-90 to 1990-91 (p <.01) and from 1990-91 to 1991-92 (p <.01). However, for the 3-4 group, the increase from 1989-90 to 1990-91 was not significant (p > .05) and there was a significant though modest increase from 1989-90 to 1990-91 (p <.01) but no significant increase from 1990-91 to 1991-92 (p > .05).

Years	Grade Level		
	K-2	3-4	5-8
1989-1990			
M	1.00	1.26	1.52
SD	2.93	2.98	3.84
1990-1991			
M	1.91	1.80	2.69
SD	4.53	3.70	5.21
1991-1992			
M	2.52	2.52	3.93
SD	4.83	3.97	6.85

Number of Hours Per Week Which Teachers Actively Involved in the Educational Technology Initiative Used Technology for Instructional Purposes

5 To examine differences in teacher reports of computer use in different subjects, a 1 x 3 Kruskal-Wallis nonparametric Analysis of Variance was performed. Grade Level (K-2, 3-4 and 5-8) was used as a between subjects factor. Teachers' responses to questionnaire items on whether they used computers to teach each of the individual subjects (writing, reading and mathematics) were used as dependent measures.

6 A main effect was found for writing ($H = 64.7745$, $p < .001$). The grade 5-8 group had the highest mean rank (472.84) followed by the grade 3-4 group (407.58) and the K-2 group (333.40). A Mann-Whitney test for 2 independent samples was used to examine the differences between the individual grade groupings. This test revealed that there were significantly more positive responses in the 5-8 group (% affirmative responses = 58.4, mean rank = 296.01) than the 3-4 group (% affirmative responses = 42.3, mean rank = 251.96) ($Z = -3.7654$, $p < .001$), as well as significantly more positive responses in the 3-4 group (% affirmative responses = 42.3, mean rank = 295.62) than the K-2 group (% affirmative responses = 24.0, mean rank = 245.92) ($Z = -4.5204$, $p < .001$).

A main effect was found for reading ($H = 49.7442$, $p < .001$). The grade K-2 group had the highest mean rank (474.15) followed by the grade 3-4 group (389.13) and the 5-8 group (353.47). A Mann-Whitney test for 2 independent samples was used to examine the differences between the individual grade groupings. This test revealed that there were significantly more positive responses in the K-2 group (% affirmative responses = 66.5, mean rank = 300.82) than the 3-4 group (% affirmative responses = 45.5, mean rank = 243.86) ($Z = -4.9193$, $p < .001$), as well as significantly more positive responses in the 3-4

group (% affirmative responses = 45.5, mean rank = 285.27) than the 5-8 group (% affirmative responses = 36.7, mean rank = 261.20) (Z = -2.0901, $p < .05$).

A main effect was found for mathematics (H = 25.7448, $p < .001$). The grade K-2 group had the highest mean rank (440.75) followed by the grade 3-4 group (411.46) and the 5-8 group (363.03). A Mann-Whitney test for 2 independent samples was used to examine the differences between the individual grade groupings. This test revealed that there were significantly more positive responses in the K-2 group (% affirmative responses = 82.5, mean rank = 281.60) than the 3-4 group (% affirmative responses = 75.3, mean rank = 261.98) (Z = -2.0587, $p < .05$), as well as significantly more positive responses in the 3-4 group (% affirmative responses = 75.3, mean rank = 289.48) than the 5-8 group (% affirmative responses = 63.3, mean rank = 256.80) (Z = -3.0323, $p < .01$). Thus, significantly more teachers in the K-2 group used computers in their mathematics instruction than did teachers in the 3-4 group and significantly more teachers in the 3-4 group used computers in their mathematics instruction than did teachers in the 5-8 group.

Finally, the Wilcoxon test for two related samples was used to examine differences between the subjects (writing, reading and mathematics) at each of the grade levels. At the K-2 level: computers were used for reading instruction by more teachers than for writing instruction (Z = -8.2121, $p < .001$); computers were used for mathematics instruction by more teachers than for writing instruction (Z = -10.1251, $p < .001$); computers were used for mathematics instruction by more teachers than for reading instruction (Z = -4.5642, $p < .001$). At the 3-4 level: there were no significant differences between reading and writing ($p > .4$); computers were used for mathematics instruction by more teachers than for writing instruction (Z = -6.6510, $p < .001$); computers were used for mathematics instruction by more teachers than for reading instruction (Z = -7.0314, $p < .001$). At the 5-8 level: computers were used for writing instruction by more teachers than for reading instruction (Z = -4.6337, $p < .001$); there were no significant differences between mathematics and writing ($p > .3$); computers were used for mathematics instruction by more teachers than for reading instruction (Z = -5.9581, $p < .001$).

Subject	Grade Level		
	K-2	3-4	5-8
Writing	24.0	42.3	58.4
Reading	66.5	45.5	36.7
Mathematics	82.5	75.3	63.3

Percent of Teachers Actively Involved in the Educational Technology Initiative Using Technology by Subject and Grade Level

7 To examine differences in the effectiveness of computers in supporting the teaching of writing, reading and mathematics, a 3 x 3 Analysis of Variance (ANOVA) was performed. Grade Level (K-2, 3-4 and 5-8) was used as a between subjects factor and Subject (Writing, Reading and Mathematics) was a within subject factor. The dependent measure was the rating which teachers gave for each subject (1 = Not Effective, 2 = Somewhat Effective, 3 = Effective, 4 = Strongly Effective, 5 = Extremely Effective).

8 A main effect was found for Subject, $F(2, 1334) = 116.16$, $p < .001$, $ms_e = 0.59$. This result indicates that teachers rated computers as most effective in mathematics instruction ($M = 4.28$, $SD = .79$) followed by writing ($M = 3.93$, $SD = 1.06$) and reading ($M = 3.64$, $SD = 1.02$). Subsequent Student-Newman-Keuls post-hoc analysis showed the mean for mathematics to be significantly higher than the means for writing and reading ($p < .01$) and the mean for writing to be significantly higher than the mean for reading ($p < .01$).

9 The Grade Level X Subject interaction reached significance, $F(4, 1334) = 19.08$, $p < .001$, $ms_e = 0.59$. This result indicates that teachers rated the effectiveness of the subjects differentially based on grade level (see means table below). Student-Newman-Keuls post-hoc analysis showed that in grades K-2, teachers felt computers could be more effective for instruction in mathematics than reading ($p < .01$) and writing ($p < .01$) and that computers could be more effective for instruction in reading than writing ($p < .05$). For the 3-4 group, mathematics remains higher than writing and reading ($p < .01$), but the positions of reading and writing are the reverse of what they were with the K-2 group. Thus, in the 3-4 group, writing is significantly higher than reading ($p < .01$). Finally, for the 5-6 group, teachers felt computers could be more effective for instruction in mathematics and writing than for reading ($p < .01$).

Finally, teacher ratings of effectiveness for writing were significantly higher for the 5-8 group than they were for the 3-4 group ($p < .01$) as well as being higher for the 3-4 group than for the K-2 group ($p < .01$). Teacher ratings of effectiveness for reading were significantly higher for the K-2 group than for the 3-4 and 5-8 groups. The teachers ratings of mathematics were uniformly high across all grade groupings.

Years	Grade Level		
	K-2	3-4	5-8
Writing			
M	3.65	3.91	4.22
SD	1.26	0.99	0.94
Reading			
M	3.85	3.50	3.57
SD	1.00	1.01	1.05
Mathematics			
M	4.31	4.26	4.27
SD	0.75	0.80	0.83

Rating of Teachers Actively Involved in the Educational Technology Initiative of the Instructional Effectiveness of Computers by Subject and Grade Level

10 To examine differences in teacher reports of the type of technology they use, a 1 x 3 Kruskal-Wallis nonparametric Analysis of Variance was performed. Grade Level (K-2, 3-4 and 5-8) was used as a between subjects factor. The teachers' response to the questionnaire items on whether they used certain types of technology equipment during the 1991-92 school year was used as the dependent measure.

11 A main effect was found for computer use in a lab ($H = 7.5404$, $p < .05$). The grade 5-8 group had the highest mean rank (424.93) followed by the grade 3-4 group (402.76) and the K-2 group (387.14). A Mann-Whitney test for 2 independent samples was used to examine the differences between the individual grade groupings. This test revealed that there were no significant differences between the 5-8 group and the 3-4 group or between the 3-4 group and the K-2 group. Thus, as was indicated by the Kruskil-Wallis analysis, significantly more teachers in the 5-8 group used computers in a lab than did teachers in the K-2 group.

A main effect was found for use of CD ROM technology ($H = 18.1701$, $p < .001$). The grade 5-8 group had the highest mean rank (428.78) followed by the grade 3-4 group (407.99) and the K-2 group (377.68). A Mann-Whitney test for 2 independent samples was used to examine the differences between the individual grade groupings. This test revealed that there were significantly more positive responses in the 3-4 group (% affirmative responses = 14.3, mean rank = 281.35) than the K-2 group (% affirmative

responses = 6.8, mean rank = 261.05) (Z = -2.8176, $p < .01$), however, there were no significant differences between the 5-8 group and the 3-4 group. Thus, significantly more teachers in the 3-4 group used CD ROM technology than did teachers in the K-2 group and significantly more teachers in the 5-8 group used CD ROM technology than did teachers in the K-2 group.

A main effect was found for use of laserdisc technology (H = 28.1539, $p < .001$). The grade 5-8 group had the highest mean rank (439.97) followed by the grade 3-4 group (402.39) and the K-2 group (372.26). A Mann-Whitney test for 2 independent samples was used to examine the differences between the individual grade groupings. This test revealed that there were significantly more positive responses in the 5-8 group (% affirmative responses = 24.3, mean rank = 286.46) than in the 3-4 group (% affirmative responses = 15.1, mean rank = 261.10) (Z = -2.7314, $p < .01$), as well as significantly more positive responses in the 3-4 group (% affirmative responses = 15.1, mean rank = 281.30) than the K-2 group (% affirmative responses = 7.6, mean rank = 261.11) (Z = -2.7206, $p < .01$). Thus, significantly more teachers in the 5-8 group used laserdisc players in their instruction than did teachers in the 3-4 group or the K-2 group and significantly more teachers in the 3-4 group used laserdisc players in their instruction than did teachers in the K-2 group.

A main effect was found for use of a scanner (H = 8.4032, $p < .05$). The grade 5-8 group had the highest mean rank (416.07) followed by the grade 3-4 group (412.14) and the K-2 group (386.18). A Mann-Whitney test for 2 independent samples was used to examine the differences between the individual grade groupings. This test revealed that there were significantly more positive responses in the 3-4 group (% affirmative responses = 13.3, mean rank = 279.94) than the K-2 group (% affirmative responses = 6.8, mean rank = 262.55) (Z = -2.4706, $p < .05$). Thus, significantly more teachers in the 5-8 group used scanners in their instruction than did teachers in the K-2 group and significantly more teachers in the 3-4 group used scanners in their instruction than did teachers in the K-2 group.

A main effect was found for use of a file server for network communications (H = 10.9634, $p < .01$). The grade 5-8 group had the highest mean rank (431.35) followed by the grade 3-4 group (403.74) and the K-2 group (379.59). A Mann-Whitney test for 2 independent samples was used to examine the differences between the individual grade groupings. This test revealed that there were no significant differences between the 5-8 group and the 3-4 group or between the 3-4 group and the K-2 group. Thus, significantly more teachers in the 5-8 group used a file server for network communications than did teachers in the K-2 group.

The following table presents an overall display of the equipment used by elementary teachers who are active computer users.

Equipment Used	Computer Users in Grades: K-2	3-4	5-8
Computer Lab[1]	76%	80%	86%
CD ROM [2, 3]	7%	14%	20%
Laserdisc Player [2, 3, 4]	8%	15%	24%
Multi-media	22%	18%	24%
Modem	3%	3%	3%
Scanner [1, 5]	7%	13%	14%
Fileserver for Network Communication[6]	21%	27%	34%

Notes:
1 K-2 vs. 5-8 comparison $p < .05$
2 K-2 vs. 5-8 comparison $p < .001$
3 K-2 vs. 3-4 comparison $p < .01$
4 3-4 vs. 5-8 comparison $p < .01$
5 K-2 vs. 3-4 comparison $p < .05$
6 K-2 vs. 5-8 comparison $p < .01$

Percent of Teachers Actively Involved in the Educational Technology Initiative Using Different Types of Technology by Grade Level

12 To examine differences in teacher reports of their instructional use of technology, a 1 x 3 Kruskal-Wallis nonparametric Analysis of Variance was performed. Grade Level (K-2, 3-4 and 5-8) was used as a between subjects factor. The teachers' response to the questionnaire item on the instructional function of the technology.

13 A main effect was found for using computers for word processing ($H = 43.0990$, $p < .001$). The grade 5-8 group had the highest mean rank (460.21) followed by the grade 3-4 group (402.77) and the K-2 group (351.32). A Mann-Whitney test for 2 independent samples was used to examine the differences between the individual grade groupings. This test revealed that there were significantly more positive responses in the 5-8 group (% affirmative responses = 80.1, mean rank = 293.31) than the 3-4 group (% affirmative responses = 65.9, mean rank = 254.54) ($Z = -3.7280$, $p < .001$), as well as significantly more positive responses in the 3-4 group (% affirmative responses = 65.9, mean rank = 288.22) than the K-2 group (% affirmative responses = 53.2, mean rank = 253.76) ($Z = -3.0150$, $p < .01$). Thus, significantly more teachers in the 5-8 group used computers for word processing than did teachers in the 3-4 group and significantly more teachers in the 3-4 group used computers for word processing than did teachers in the K-2 group.

A main effect was found for grading/record keeping ($H = 31.0199$, $p < .001$). The grade 5-8 group had the highest mean rank (448.21) followed by the grade 3-4 group (413.22) and the K-2 group (352.41). A Mann-Whitney test for 2 independent samples was used to examine the differences between the individual grade groupings. This test revealed that there were significantly more positive responses in the 5-8 group (% affirmative responses = 67.8, mean rank = 285.57) than the 3-4 group (% affirmative responses = 59.1, mean rank = 261.95) ($Z = -2.0953$, $p < .05$), as well as significantly more positive responses in the 3-4 group (% affirmative responses = 59.1, mean rank = 291.27) than the K-2 group (% affirmative responses = 44.1, mean rank = 250.53) ($Z = -3.4975$, $p < .001$). Thus, significantly more teachers in the 5-8 group used computers for grading/record keeping than did teachers in the 3-4 group and significantly more teachers in the 3-4 group used computers for grading/record keeping than did teachers in the K-2 group.

A main effect was found for using computers as a reward ($H = 7.2136$, $p < .05$). The grade 3-4 group had the highest mean rank (420.27) followed by the grade 5-8 group (416.02) and the K-2 group (377.61). A Mann-Whitney test for 2 independent samples was used to examine the differences between the individual grade groupings. This test revealed that there were significantly more positive responses in the 5-8 group (% affirmative responses = 50.6, mean rank = 277.99) than the K-2 group (% affirmative responses = 41.1, mean rank = 252.82) ($Z = -2.1919$, $p < .05$). Thus, significantly more teachers in the 3-4 group used computers as a reward than did teachers in the K-2 group and significantly more teachers in the 5-8 group used computers as a reward than did teachers in the K-2 group.

A main effect was found for testing ($H = 40.3447$, $p < .001$). The grade 5-8 group had the highest mean rank (458.34) followed by the grade 3-4 group (402.48) and the K-2 group (353.52). A Mann-Whitney test for 2 independent samples was used to examine the differences between the individual grade groupings. This test revealed that there were significantly more positive responses in the 5-8 group (% affirmative responses = 46.1, mean rank = 292.76) than the 3-4 group (% affirmative responses = 32.3, mean rank = 255.06) ($Z = -3.3038$, $p < .001$), as well as significantly more positive responses in the 3-4 group (% affirmative responses = 32.3, mean rank = 287.42) than the K-2 group (% affirmative responses = 20.2, mean rank = 254.61) ($Z = -3.1932$, $p < .01$). Thus, significantly more teachers in the 5-8 group used computers for testing than did teachers in the 3-4 group and significantly more teachers in the 3-4 group used computers for testing than did teachers in the K-2 group.

A main effect was found for using simulations ($H = 20.0992$, $p < .001$). The grade 5-8 group had the highest mean rank (428.65) followed by the grade 3-4 group (422.26) and the K-2 group (362.68). A Mann-Whitney test for 2 independent samples was used to examine the differences between the individual grade groupings. This test revealed that there were significantly more positive responses in the 3-4 group (% affirmative responses = 35.1, mean rank = 290.87) than the K-2 group (% affirmative responses = 20.6, mean rank = 250.96) ($Z = -3.8096$, $p < .001$), however, there were no significant differences between the 5-8 group and the 3-4 group. Thus, significantly more teachers in the 3-4 group used technology for simulations than did teachers in the K-2 group and significantly more teachers in the 5-8 group used technology for simulations than did teachers in the K-2 group.

Instructional Purpose	Grade K-2	3-4	5-8
Teach Core Curriculum	72%	73%	75%
Games	67%	69%	70%
Word Processing [1,2,3]	53%	66%	80%
Grading [1,4,5]	44%	59%	68%
Reward [6,7]	41%	63%	51%
Testing [1,2,3]	20%	32%	46%
Simulations [1,3]	21%	35%	37%
Visual Presentations	10%	12%	17%
Telecommunications	10%	9%	15%

Notes:
1 K-2 vs. 5-8 comparison $p < .001$
2 K-2 vs. 3-4 comparison $p < .05$
3 3-4 vs. 5-8 comparison $p < .001$
4 K-2 vs. 3-4 comparison $p < .001$
5 3-4 vs. 5-8 comparison $p < .05$
6 K-2 vs. 5-8 comparison $p < .001$
7 K-2 vs. 3-4 comparison $p < .05$

Percent of Teachers Actively Involved in the Educational Technology Initiative Using Technology for Different Instructional Purpose by Grade Level

14 A main effect was found for higher order thinking ($H = 7.8570$, $p < .05$). The grade 5-8 group had the highest mean rank (429.15) followed by the grade 3-4 group (404.57) and the K-2 group (380.94). A Mann-Whitney test for 2 independent samples was used to examine the differences between the individual grade groupings. This test revealed that there were no significant differences between the 5-8 group and the 3-4 group or between the 3-4 group and the K-2 group. Thus, significantly more teachers in the 5-8 group used computers for higher order thinking than did teachers in the K-2 group.

A main effect was found for enhancing creativity ($H = 14.9104$, $p < .001$). The grade 5-8 group had the highest mean rank (437.20) followed by the grade 3-4 group (406.62) and the K-2 group (370.60). A Mann-Whitney test for 2 independent samples was used to examine the differences between the individual grade groupings. This test revealed that there were significantly more positive responses in the 3-4 group (% affirmative responses = 59.9, mean rank = 283.21) than the K-2 group (% affirmative responses = 51.0, mean rank = 259.08) ($Z = -2.0834$, $p < .05$), however, there were no significant differences between the 5-8 group and the 3-4 group. Thus, significantly more teachers in the 3-4 group used technology for enhancing creativity than did teachers in the K-2 group and

significantly more teachers in the 5-8 group used technology for enhancing creativity than did teachers in the K-2 group.

	Grade		
Instruction Goal	K-2	3-4	5-8
Drill and Practice	84%	82%	80%
Enrichment	73%	74%	75%
Review and Remediation	75%	68%	69%
Higher Order Thinking [1]	54%	60%	66%
Creativity Enhancement [2,3]	51%	60%	67%
Concept Introduction	41%	41%	50%

Notes:
1 K-2 vs. 5-8 comparison $p < .05$
2 K-2 vs. 5-8 comparison $p < .001$
3 K-2 vs. 3-4 comparison $p < .05$

Percent of Teachers Actively Involved in the Educational Technology Initiative Using Technology for Different Instructional Goals by Grade Level

Chapter 3

ETI Inservice Programs for Elementary Teachers

ETI Inservice Programs for Elementary Teachers

While computers and other educational technology have the potential to be useful instructional tools, most teachers require training and support to use these tools successfully. This chapter presents the results of a survey of elementary computer users regarding the length of training they received and its effectiveness, and the type of organization providing the training. We also analyze the relationship between inservice training and the use of instructional technology in the classroom.

Methodology, Limitations, and Statistical Notes

In October 1991, we distributed surveys to all 387 elementary schools receiving ETI funding. Copies of these surveys appear in Appendix A. We asked each school's principal to distribute surveys to two teachers in each of three grade groupings (K-2, 3-4 and 5-8) ***who were actively involved in the school's ETI project***. Overall, 960 elementary teachers returned their surveys (313 K-2 teachers, 329 3-4 teachers and 318 5-8 teachers). This represents an average of 2.5 teachers per school, an overall return rate of 82 percent. All surveys from teachers in grades K-4 were included in the analysis. For grades 5-8, we only included teachers who taught in self-contained classrooms in the analysis. This was done to account for the variety of grade configurations found in Utah elementary schools.

There are limitations to this sampling procedure, and the following results should be read with these limitations in mind. Although we surveyed all ETI schools and all grade levels, and the sample of elementary schools can be assumed to be representative of ETI schools in Utah, ***the sample of teachers***

within schools is probably biased towards more active computer users. Inferences should not be made from these data concerning the extent of computer use by teachers in general. The following results, however, should reflect the usage patterns and attitudes of elementary teachers who actively use computers in their instruction.

The following sections describe the results of this survey in words and graphs. Where appropriate, we have also conducted statistical tests to examine differences among groups. The nature and results of these tests are described in the endnotes following this chapter. In the text of this chapter, when the word "significant" is used, it means that a statistical test was performed on the data and differences were found to be statistically reliable at the .05 level or below.

Duration of ETI Inservice Programs for Elementary Teachers

We asked elementary teachers who were actively involved in the Educational Technology Initiative to report how much inservice training they had received since September 1990, the initial year of the program. Nearly one-half (46%) of the elementary teachers reported they had received *no* ETI inservice training; 12 percent of teachers received less than 3 hours of training, 22 percent of teachers received 3-10 hours and 19 percent received more than 10 hours of ETI training. These results are displayed on Figure 3.1.

Unlike most of the findings regarding computer usage discussed in the previous chapter, the amount of inservice reported by elementary computer users did not differ by grade level. Teachers at all grade levels reported receiving minimal staff development. This finding is not surprising, since during the initial year of implementation, ETI provided no funds for staff development.

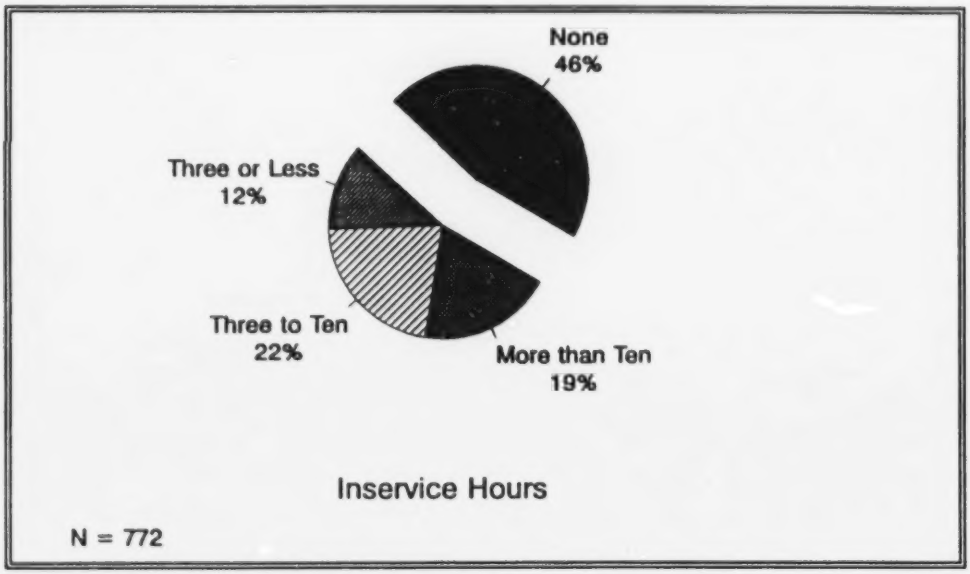

Figure 3.1: Duration of ETI Inservice Received by Elementary Teachers Actively Involved in the Educational Technology Initiative

This policy is in marked contrast to standard practice in business and industry which typically allocates about 50% of funding in a technology project for training employees to use the newly installed equipment.

Although there were no grade level differences in the training received, there were subject matter differences as shown on Figure 3.2.[1] The average elementary teacher actively involved with the educational technology initiative received significantly more training in writing (5.5 hours) and mathematics (5.0 hours), than in reading (2.8 hours).[2]

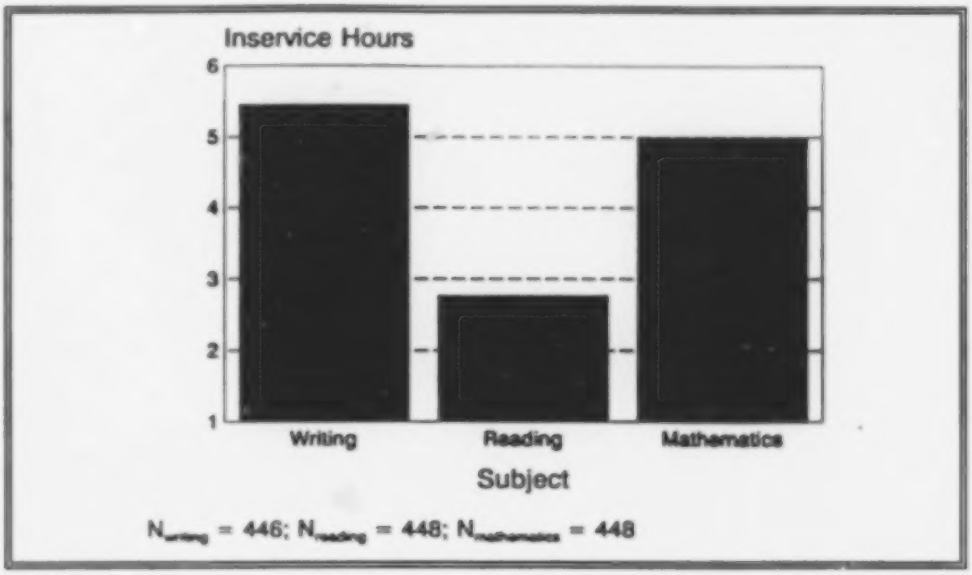

Figure 3.2: Duration of ETI Inservice Received by Elementary Teachers Actively Involved in the Educational Technology Initiative by Subject

Effectiveness of ETI Inservice Programs for Elementary Teachers

Elementary teachers involved in the Educational Technology Initiative were asked to rate the effectiveness of the training they received in each subject area using a 5-point scale, running from Not Effective (1) to Extremely Effective (5).[3] As illustrated on Figure 3.3, respondents viewed the mathematics inservice they received as significantly more effective than inservice training in reading or writing.[4] At the same time, it must be remembered that the effectiveness rating for all subjects is numerically quite close and corresponds roughly to the scale point labeled "effective."

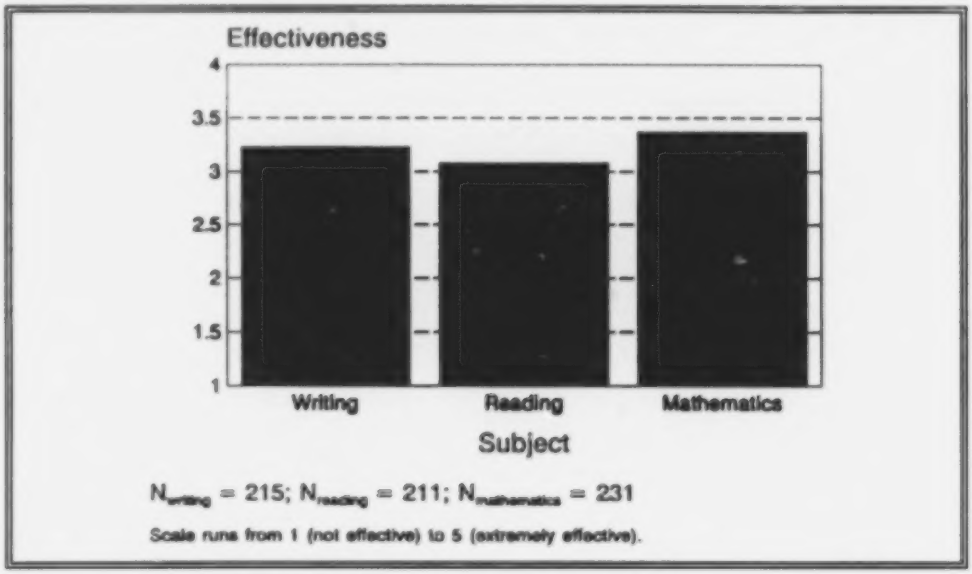

Figure 3.3: Effectiveness of ETI Inservice Received by Elementary Teachers Actively Involved in the Educational Technology Initiative by Subject

Inservice Training Providers

One of the goals of the Educational Technology Initiative was to encourage Technology vendors to make a major commitment to providing inservice for Utah's teachers. As Figure 3.4 indicates, this goal has not been met.

The majority of inservice training was done by district staff and teachers, as shown in Figure 3.4. About 70 percent of ETI training was done by district personnel and teachers with some assistance from technology vendors and university faculty. The majority of this training (54%) was provided by district personnel and teachers, 14 percent was done by district personnel in collaboration with computer vendors and about 3 percent of the training was conducted in collaboration with university faculty.

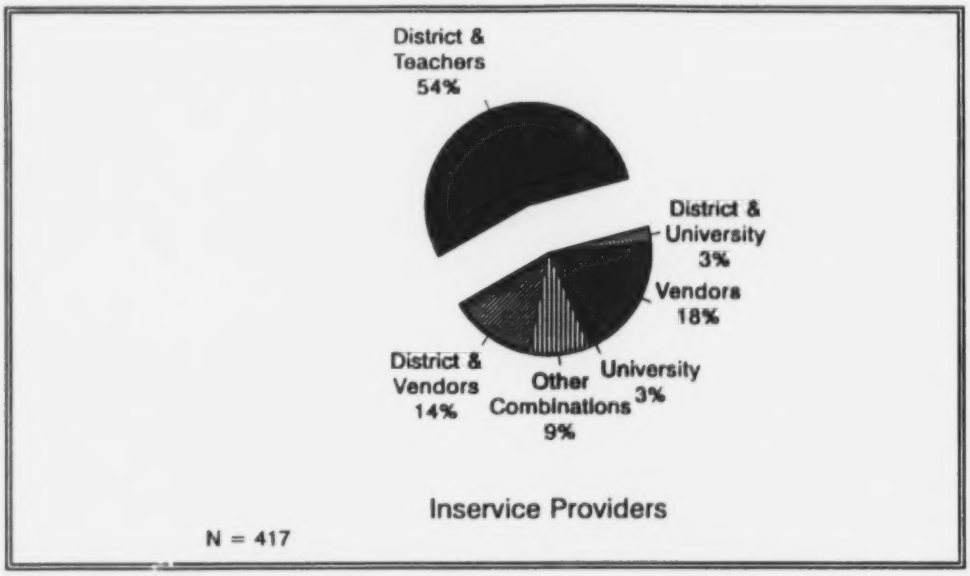

Figure 3.4: Percent of ETI Elementary Inservice Training Provided by Different Types of Organizations

Vendors alone provided about 18 percent of training and university faculty alone provided only 3 percent of training.

It appears that Utah's Technology vendors and universities are not providing the inservice training and support envisioned in the ETI legislation, which sought to bargain millions of dollars in hardware purchases in return for extensive inservice support. Similarly, these results suggest that the universities have been notably absent as inservice resources.

The majority of teachers have been left to rely on other teachers and the resources available in their own districts. It is questionable whether these resources are sufficient to provide the massive training and support program necessary to facilitate widespread, innovative use of educational technology in Utah elementary schools.

The Relationship of Inservice Training to Computer Use

Although many elementary teachers did not receive inservice training, a higher proportion of those who did reported using all types of technology as displayed on Figure 3.5.[5] Moreover, we found statistically significant differences in the proportion of teachers using of CD ROM's, laserdisc players, and modems.[6]

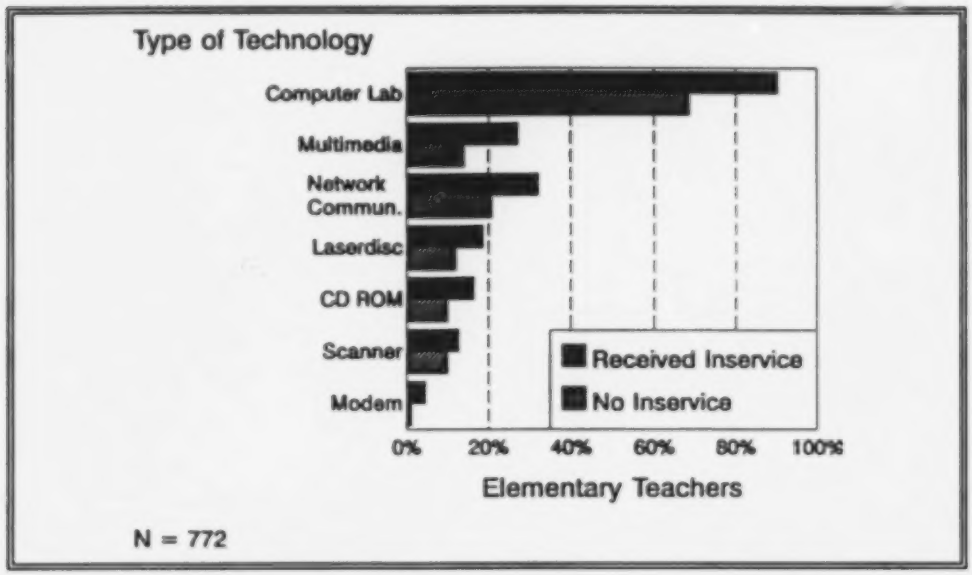

Figure 3.5: Percent of Elementary Teachers Who Did and Did Not Receive Inservice Using Different Types of Technology

Staff development was also associated with teachers' use of computers for a variety of instructional goals.[7] When compared to elementary teachers not receiving any inservice support, a significantly higher proportion of the elementary teachers who received staff development used computers for a variety of instructional goals.[8] This finding is displayed on Figure 3.6.

The elementary teachers who received inservice were also more likely to use computers for a variety of instructional purposes including the presentation of new concepts and communications with others. Teachers receiving inservice training were also more likely to automate their grading, testing and record keeping.[9] This is illustrated on Figure 3.7.

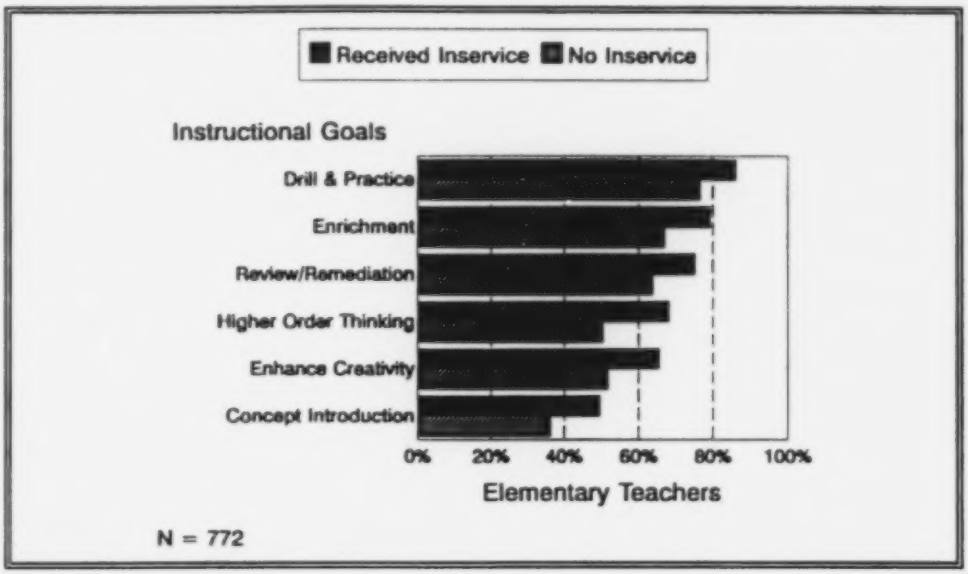

Figure 3.6: Percent of Elementary Teachers Who Did and Did Not Receive Inservice Using Computers for Different Instructional Goals

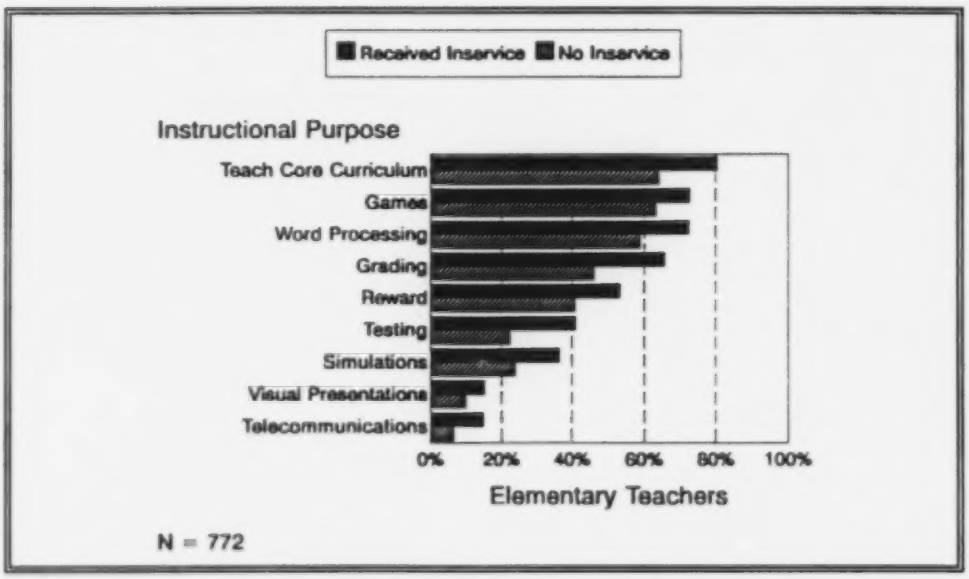

Figure 3.7: Percent of Elementary Teachers Who Did and Did Not Receive Inservice Using Computers for Different Instructional Purposes

These data demonstrate that a significantly higher proportion of teachers receiving inservice training use computers and associated equipment more frequently than those not receiving training. A higher proportion of teachers also use computers for more sophisticated instructional goals and purposes. These differences are striking when considered in the context of the small amount of training teachers received. The majority of the trained teachers received less than 10 hours of training. A minimal amount of training, therefore, can support significant computer usage. Whether the inservice merely provided support for teachers already committed to computer use or whether it influenced teachers to use computers more cannot be determined from these data. What is clear, however, is that inservice training increases the instructional use and value of equipment purchased with ETI funds.

Summary and Discussion: ETI Inservice Programs for Elementary Teachers

The following points summarize our findings about the inservice received by elementary teachers actively involved in the Utah Educational Technology Initiative.

- The majority of elementary computer users (46%) received no inservice training to support the integration of technology into their instruction. Forty-one percent received three or more hours of inservice training;

- Elementary teachers actively involved in the Educational Te;chnology Initiative received, on average, 5 hours of writing and mathematics inservice, and nearly 3 hours of inservice in reading;

- The average elementary computer user receiving inservice training rated that training as "effective" (3) on a scale running from "not effective" (1) to "extremely effecitve" (5).

- Most inservice training was provided by teachers and school district personnel. This was sometimes supplemented with representatives from vendors and universities. Vendors alone provided less than 20% of ETI inservice for elementary teachers; and

- Elementary computer users receiving ETI inservice were more like to use all types of computer technology more than elementary computer users not receiving inservice. ETI trained teachers were also more likely to use computers to stimulate higher order thinking and creativity.

Although the elementary teachers receiving ETI inservice training appear generally satisfied with it, this group is far too few in number. Nearly one-half of elementary teachers actively involved in the Educational Technology Initiative received no training at all. This is patently unacceptable in light of the Initiative's goals.

Teachers who can use computers in ways that challenge students and enhance their deep understanding of subject matter must be competent in at least two areas. First, they must be subject matter experts who know their subjects well and know how to engage students in thinking carefully about these subjects. Second, they must be technologically competent and understand the pedagogical possibilities of computers. Without this combination of pedagogical and technological expertise, teachers will be limited in their use of computers. They may be able, for example, to turn on the machines in the computer lab and plug students into the electronic worksheets characterizing much of the currently available educational software, but they will be unable to use technology as a tool to support and extend significant student learning, a vital goal of Utah's Educational Technology Initiative.

As evaluators, we believe more attention and resources must be devoted to training elementary teachers to use the technology purchased with ETI funds. This will significantly increase the educational return on ETI's financial investment and enable more teachers to use technology in educationally innovative ways.

Endnotes

1 A series of matched-pairs t-tests were used to examine differences in the amount of inservice training respondents received in writing, reading and mathematics. T-tests were used because ANOVA would require data in all three of the cells (writing, reading and mathematics) and many subjects had not had inservice training in all three areas. Thus, an inordinately large number of subjects would be removed from the analysis if ANOVA were used. The matched-pairs t-tests compared: writing and reading; writing and mathematics; and reading and mathematics.

2 The analysis which compared writing and reading showed that teachers had received significantly more training in writing (M = 5.4507) than they had in reading (M = 2.7584) (t = 6.49, df = 445, $p < .001$).

The analysis which compared writing and mathematics showed that teachers had not received significantly different amounts of training in writing (M = 5.4507) than they had in mathematics (M = 4.9770) (t = 1.02, df = 445, $p > .3$).

The analysis which compared reading and mathematics showed that teachers had received significantly more training in mathematics (M = 4.9950) than they had in reading (M = 2.7761) (t = -6.66, df = 449, $p < .001$).

	M	*SD*
Subject		
Writing	5.45	7.68
Reading	2.77	4.89
Mathematics	4.99	7.69

Hours of Inservice Training Received by Elementary Teachers Actively Involved in the Educational Technology Initiative by Subject

3 A series of matched-pairs t-tests were used to examine differences in the effectiveness of inservice training respondents received in writing, reading and mathematics. T-tests were used because ANOVA would require data in all three of the cells (writing, reading and mathematics) and many subjects had not had inservice training in all three areas. Thus, an inordinately large number of subjects would be removed from the analysis if ANOVA were used. The matched-pairs t-tests compared: writing and reading; writing and mathematics; and reading and mathematics.

4 The analysis which compared writing and reading showed that teachers did not rate their training in writing (M = 3.1949) as different from their training in reading (M = 3.1026) (t = 1.30, df = 194, $p > .1$).

The analysis which compared writing and mathematics showed that teachers rated their training in mathematics (M = 3.4362) significantly more effective than the training received in writing (M = 3.2723) (t = -2.21, df = 234, $p < .05$).

The analysis which compared reading and mathematics showed that teachers rated their training in mathematics (M = 3.3128) significantly more effective than their training in reading (M = 3.0573) (t = -5.21, df = 226, $p < .001$).

	M	*SD*
Subject		
Writing	3.23	1.13
Reading	3.08	1.07
Mathematics	3.27	1.03

Effectiveness of Inservice Training Received by Elementary Teachers Actively Involved in the Educational Technology Initiative by Subject

5 To examine differences in the type of technology used between teachers who did and did not receive inservice training, we divided elementary computer users responding to the survey into two groups: (1) 456 teachers who had received some type of ETI inservice training; and (2) 353 teachers who had **not** received any ETI inservice training. We performed a Mann-Whitney nonparametric test to compare differences between the two independent samples. The teachers' responses to questionnaire items on whether they used certain types of technology equipment during the 1991-92 school year was used as the dependent measure.

6 Respondents were significantly more likely to use computers in a lab if they had received some form of inservice training (% affirmative responses = 90.4, mean rank = 443.47) than if they had received no inservice training (% affirmative responses = 68.6, mean rank = 355.31) (Z = -7.8071, $p < .001$).

Respondents were significantly more likely to use CD ROM technology if they had received some form of inservice training (% affirmative responses = 16.4, mean rank = 416.53) than if they had received no inservice training (% affirmative responses = 9.9, mean rank = 390.11) (Z = -2.6866, $p < .01$).

Respondents were significantly more likely to use a laserdisc player if they had received some form of inservice training (% affirmative responses = 18.6, mean rank = 416.90) than if they had received no inservice training (% affirmative responses = 11.9, mean rank = 389.63) (Z = -2.6127, $p < .01$).

Respondents were significantly more likely to use multi-media technology if they had received some form of inservice training (% affirmative responses = 27.2, mean rank = 428.50) than if they had received no inservice training (% affirmative responses = 13.9, mean rank = 374.65) (Z = -4.5768, $p < .001$).

Respondents were significantly more likely to use a modem if they had received some form of inservice training (% affirmative responses = 4.6, mean rank = 411.13) than if they had received no inservice training (% affirmative responses = 1.1, mean rank = 397.08) (Z = -2.8284, $p < .01$).

Respondents were significantly more likely to use a fileserver for network communication if they had received some form of inservice training (% affirmative responses = 32.2, mean rank = 425.40) than if they had received no inservice training (% affirmative responses = 20.7, mean rank = 378.65) (Z = -3.6614, $p < .001$).

Equipment Used	Inservice	
	None	Some
Computer Lab	69%	90%
Classroom Computers	38%	61%
CD ROM [1]	10%	16%
Laserdisc Player [1]	12%	19%
Multi-media	14%	27%
Modem [1]	1%	5%
Scanner	10%	13%
Fileserver for Network Communications	21%	32%

All comparisons between None and Some Inservice Columns significant at $p < .001$ except as noted.

1 $p < .01$

Percent of Teachers Who Did and Did Not Receive Inservice Using Different Types of Technology

7 To examine differences in teacher reports of their instructional use of technology based on whether they received inservice training, we performed a Mann-Whitney nonparametric test for comparing differences between two independent samples. The teachers' responses to questionnaire items on whether they used technology in their instruction during the 1991-92 school year was used as the dependent measure.

8 Respondents were significantly more likely to use technology for drill and practice if they had received some form of inservice training (% affirmative responses = 86.2, mean rank = 422.12) than if they had received no inservice training (% affirmative responses = 76.5, mean rank = 382.89) (Z = -3.5545, $p < .001$).

Respondents were significantly more likely to use technology for enrichment if they had received some form of inservice training (% affirmative responses = 79.2, mean rank = 425.23) than if they had received no inservice training (% affirmative responses = 67.7, mean rank = 378.87) (Z = -3.6911, $p < .001$).

Respondents were significantly more likely to use technology for review or remediation if they had received some form of inservice training (% affirmative responses = 75.2, mean rank = 425.26) than if they had received no inservice training (% affirmative responses = 63.7, mean rank = 378.83) (Z = -3.5386, $p < .001$).

Respondents were significantly more likely to use technology for instilling higher order thinking skills in students if they had received some form of inservice training (% affirmative responses = 68.0, mean rank = 435.99) than if they had received no inservice training (% affirmative responses = 50.4, mean rank = 364.97) (Z = -5.0591, $p < .001$).

Respondents were significantly more likely to use technology for enhancing creativity if they had received some form of inservice training (% affirmative responses = 65.4, mean rank = 428.84) than if they had received no inservice training (% affirmative responses = 51.8, mean rank = 374.20) (Z = -3.8789, $p < .001$).

Respondents were significantly more likely to use technology for introducing new concepts if they had received some form of inservice training (% affirmative responses = 49.6, mean rank = 428.48) than if they had received no inservice training (% affirmative responses = 36.3, mean rank = 374.67) (Z = -3.7796, $p < .001$).

Instructional Goals	Inservice	
	None	Some
Drill and Practice	77%	86%
Enrichment	68%	79%
Review and Remediation	64%	75%
Higher Order Thinking	50%	68%
Creativity Enhancement	52%	65%
Concept Introduction	36%	50%

All comparisons between None and Some Inservice Columns significant at $p < .001$.

Percent of Elementary Teachers Who Did and Did Not Receive Inservice Using Computers for Different Instructional Goals

9 Respondents were significantly more likely to use technology for achieving State Core objectives if they had received some form of inservice training (% affirmative responses = 80.5, mean rank = 434.05) than if they had received no inservice training (% affirmative responses = 64.0, mean rank = 367.47) (Z = -5.2450, $p < .001$).

Respondents were significantly more likely to use technology for games if they had received some form of inservice training (% affirmative responses = 72.6, mean rank = 421.62) than if they had received no inservice training (% affirmative responses = 63.2, mean rank = 383.53) (Z = -2.8567, $p < .01$).

Respondents were significantly more likely to use technology for word processing if they had received some form of inservice training (% affirmative responses = 72.4, mean rank = 428.73) than if they had received no inservice training (% affirmative responses = 58.9, mean rank = 374.35) (Z = -4.0157, $p < .001$).

Respondents were significantly more likely to use technology for grading or record keeping if they had received some form of inservice training (% affirmative responses = 65.6, mean rank = 439.23) than if they had received no inservice training (% affirmative responses = 46.2, mean rank = 360.78) (Z = -5.5242, $p < .001$).

Respondents were significantly more likely to use technology as a reward if they had received some form of inservice training (% affirmative responses = 53.3, mean rank = 427.06) than if they had received no inservice training (% affirmative responses = 40.8, mean rank = 376.51) (Z = -3.5265, $p < .001$).

Respondents were significantly more likely to use technology for testing if they had received some form of inservice training (% affirmative responses = 41.0, mean rank = 437.88) than if they had received no inservice training (% affirmative responses = 22.4, mean rank = 362.53) (Z = -5.5902, $p < .001$).

Respondents were significantly more likely to use technology for simulations if they had received some form of inservice training (% affirmative responses = 36.4, mean rank = 427.16) than if they had received no inservice training (% affirmative responses = 23.8, mean rank = 376.37) (Z = -3.8292, $p < .001$).

Respondents were significantly more likely to use technology for visual presentations if they had received some form of inservice training (% affirmative responses = 15.1, mean rank = 414.21) than if they had received no inservice training (% affirmative responses = 9.9, mean rank = 393.11) (Z = -2.1971, $p < .05$).

Respondents were significantly more likely to use technology for telecommunication if they had received some form of inservice training (% affirmative responses = 14.9, mean rank = 419.82) than if they had received no inservice training (% affirmative responses = 6.5, mean rank = 385.86) (Z = -3.7463, $p < .001$).

Instructional Purpose	Inservice	
	None	Some
Teach Core Curriculum	64%	81%
Games	63%	73%
Word Processing	60%	72%
Grading	46%	66%
Reward	41%	53%
Testing	22%	41%
Simulations	24%	36%
Visual Presentations [1]	10%	15%
Telecommunications	7%	15%

All comparisons between None and Some Inservice Columns significant at $p < .001$ except as noted.

1 $p < .05$

Percent of Elementary Teachers Who Did and Did Not Receive Inservice Using Computers for Different Instructional Purposes

Chapter 4

Technology Use in Utah Secondary Schools:

A Study of Teachers Actively Involved in the Educational Technology Initiative

Technology Use in Utah Secondary Schools:
A Study of Teachers Actively Involved in the Educational Technology Initiative

In the previous chapters we have described the technology used and the training received by Utah elementary teachers. We now move up the grades to consider how Utah secondary teachers use educational technology. Like their elementary colleagues, secondary teachers have benefitted greatly from the hardware made available and the enthusiasm generated by the Educational Technology Initiative (ETI). The pivotal role of the teacher, however, in guiding student technology use cannot be overemphasized. If technology is to be a natural part of students' instructional lives and help to extend students' learning and understanding of complex subject matter, teachers must be competent technology users.

This chapter considers computer use by Utah secondary teachers actively involved in the Educational Technology Initiative. It concludes with a summary of our findings.

Methodology, Limitations, and Statistical Notes

In October 1991, we distributed surveys to all 197 secondary schools receiving ETI funding. Copies of these surveys appear in Appendix A. We asked the principals of these schools to distribute surveys to two teachers in each of three grade groupings (6-8, 9-10, and 11-12) who taught mathematics or English and ***who were actively involved in the school's ETI project***. If the school enrollment was greater than the median Utah high school or median Utah middle/junior

high school enrollment, we sent the principal four surveys for each grade group. Otherwise, principals received two surveys for each grade group. A total of 523 secondary teachers returned their surveys (163 6-8 teachers, 204 9-10 teachers, and 156 11-12 teachers). This represented an average of 2.7 teachers per secondary school, and a return rate of 74%.

All surveys from teachers in grades 9-12 were included in the analysis. For grades 5-8, we only included teachers who taught in departmentalized classrooms.

As with the elementary surveys discussed earlier, there are limitations to this sampling procedure. Although we surveyed all ETI secondary schools and all grade levels, and the sample of secondary schools can be assumed to be representative of ETI schools in Utah, ***the sample of teachers within schools is probably biased towards more active computer users. Inferences should not be made from these data concerning the extent of computer use by the "average" teacher.*** The following results, however, should reflect the usage patterns and attitudes of secondary teachers who actively use computers in their instruction.

The following sections describe the results of this survey in words and graphs. Where appropriate, we have also conducted statistical tests to examine differences among groups. The nature and results of these tests are described in the endnotes following this chapter. In the text of this chapter, when the word "significant" is used, it means that a statistical test was performed on the data and differences were found to be statistically reliable at the .05 level or below.

Computer Use

We asked secondary teachers actively involved in the Educational Technology Initiative to report how many hours in a typical week they used computers for

instructional purposes.[1] We focused on three time periods: 1989-90 (before ETI), 1990-91 (the first year of ETI), and 1991-92 (the second year of ETI). Secondary teachers reported using computers in their teaching significantly more hours per week in 1991-92 than they did before the initiation of ETI. In fact, the number of hours of technology use increased significantly from 1989-90 to 1990-91 and increased significantly again from 1990-91 to 1991-92.[2]

As is shown on Figure 4.1, these teachers reported using technology for an average of 3.61 hours a week in 1989-90, for an average of 5.46 hours a week in 1990-91 and for an average of 7.76 hours per week in 1991-92.

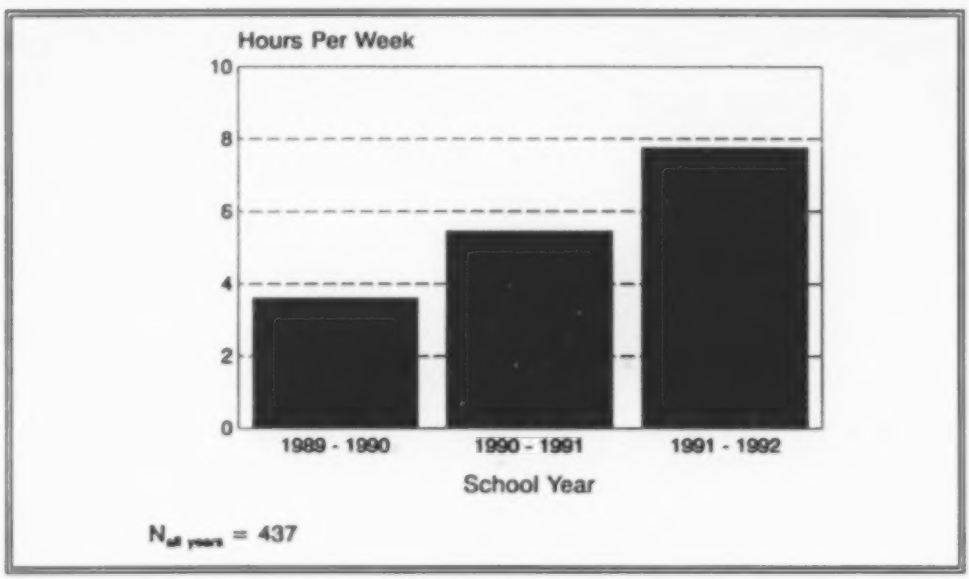

Figure 4.1: Computer Use by Secondary Teachers Actively Involved in the Educational Technology Initiative

According to these teachers' estimates, between 1989 and 1992, the amount of instructional time spent using computers more than doubled in Utah secondary schools. During the same period, the number of computers available

for student use in the secondary grades increased by about 40% from 6,253 to 10,855, and the student-computer ratio decreased.

In 1989, there were 18 middle/junior high school students sharing one computer; in 1992, the student-computer ratio was 11 to 1. In high schools, the student-computer ratio declined from 10 to 1 to 6 to 1 during the same period. (Mergendoller, Stoddart, Bradshaw & Niederhauser, 1992). Secondary teachers appear to be utilizing the computers made available to them through ETI.

The increase in student hours of computer use from 1989 to 1992 is significantly greater in secondary schools (4.4 hours per week) than in elementary schools (1.7 hours per week), although both types of schools had approximately the same number of computers available for students. According to the elementary and secondary principals responding to our survey, in November 1991 there were 10,855 computers in secondary schools and 10,786 computers in elementary schools. Secondary teachers, therefore, are making a greater use of the available computers than elementary school teachers. This may be a function of their greater experience with computer-assisted instruction. In 1989, before ETI, secondary teachers had more computers available to them and used them more frequently than elementary school teachers (Mergendoller, *et al.*, 1992).

Grade Level Differences in Computer Use

Although the use of technology for instructional purposes increased significantly between 1989 and 1992 at all secondary grade levels, teachers in grades 11-12 used computers more frequently than teachers in lower grade levels. This is displayed on Figure 4.2.

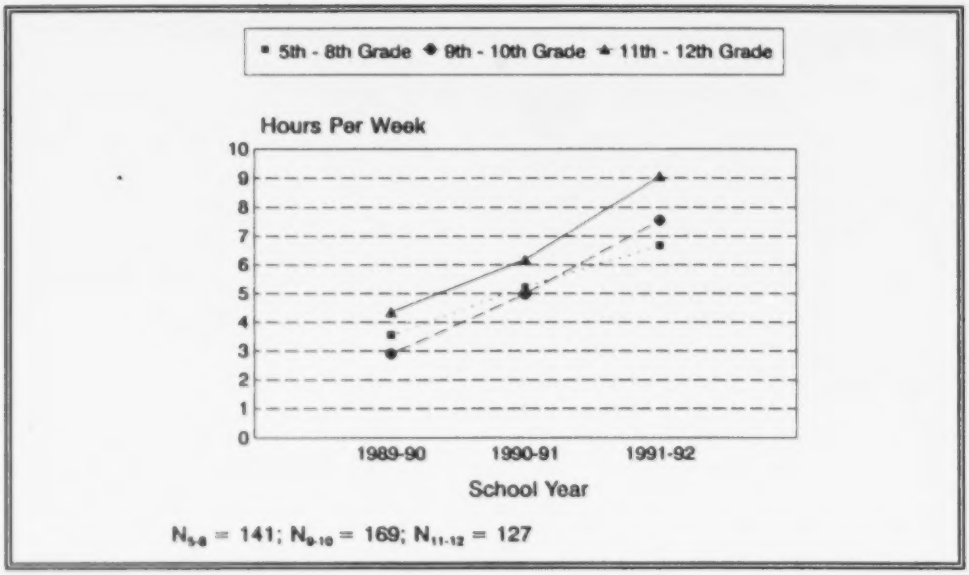

Figure 4.2: Computer Use by Elementary Teachers Actively Involved in the Educational Technology Initiative by Grade Level

Over the three-year period from 1989 to 1992, teachers in grades 11-12 began to spend increasingly more instructional hours using technology than teachers in grades 6-10; 10th grade teachers also increased their computer use significantly more than 6th, 7th and 8th grade teachers.

In 1989-90, before ETI, teachers in grades 6, 7, 8, 11 and 12 used computers significantly more than 9th and 10th grade teachers. In 1990-91, the first year of ETI, 9th and 10th grade teachers increased their computer use significantly and caught up with 6th, 7th and 8th grade teachers. The greatest amount of use, however, was still by 11th and 12th grade teachers.

By 1991-92, 9th and 10th grade teachers were using technology significantly more than 6th, 7th and 8th grade teachers. These findings parallel the findings of the elementary teacher survey reported in the previous chapter: the higher the grade level taught the greater amount of time teachers use computers.[3]

The Utah ETI principal survey (Mergendoller, *et al.*, 1992) also indicated that teachers at the higher grades use computers more *in instruction than teachers* in the lower grades, and thus confirms secondary teachers' self-reports of their computer use.

The data collected in this survey do not provide information about the causes of such grade level differences, but similar findings were reported in a Florida study (Milton, Herrington, Arthur & Owens, 1989). Here, only one-third of elementary teachers used computers compared to two-thirds of high school teachers. This disparity in use may be caused by a variety of factors including access to computers, student developmental levels, grade level curriculum objectives, availability of software and teacher expertise.

Computer Use in Different Subjects

Secondary teachers actively involved in the Educational Technology Initiative use computers most frequently for writing instruction (53%) followed by mathematics instruction (38%) and reading instruction (20%).[4] English teachers thus appear to use computers with their students for word processing more than they do for basic reading instruction. Compared to English teachers, there are fewer mathematics teachers that use computers for instructional purposes. Only 10%-20% of all secondary teachers use computers to assist them in teaching reading. These results are displayed on Figure 4.3.

There are differences in subject area use patterns at different grade levels.[5] These are displayed on Figure 4.4. Significantly more teachers in grades 5-10 report using the computer for reading than teachers in grades 11-12.

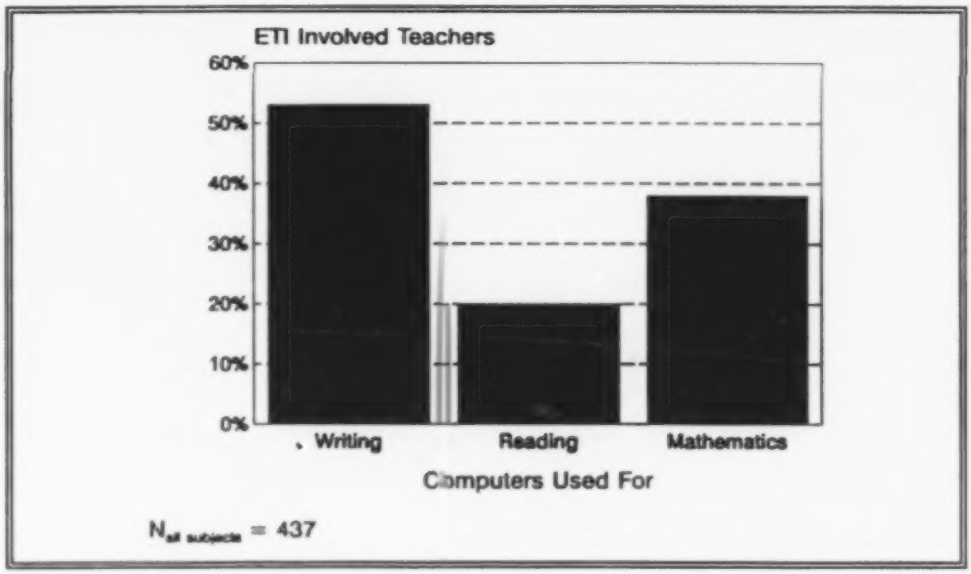

Figure 4.3: Computer Use by Secondary Teachers Actively Involved in the Educational Technology Initiative by Subject

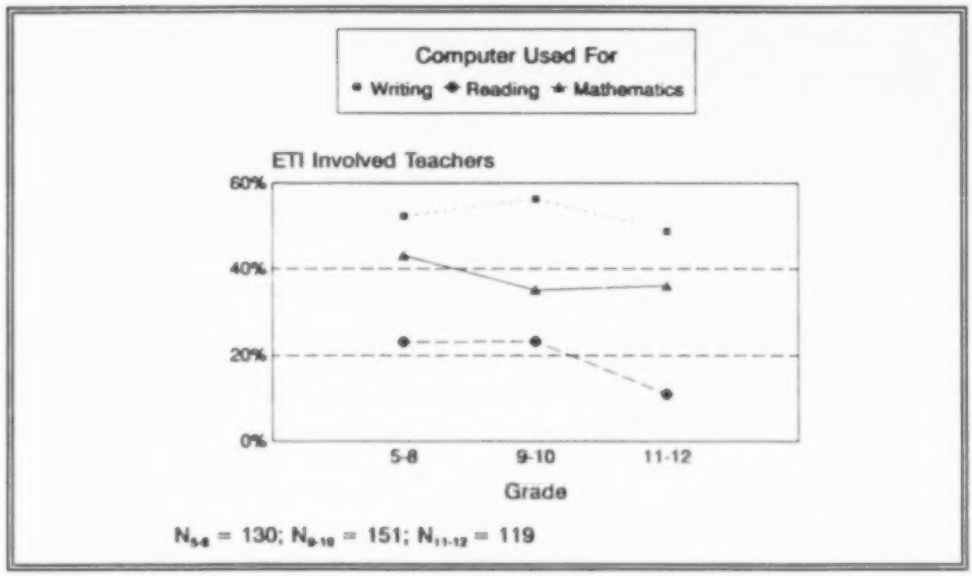

Figure 4.4: Computer Use by Secondary Teachers Actively Involved in the Educational Technology Initiative by Grade Level

The Effectiveness of Using Computers in Instruction

Secondary teachers actively involved in the Educational Technology Initiative believe computers can be used most effectively for writing instruction ($\bar{x}$ = 4.32), followed by mathematics instruction ($\bar{x}$ = 4.05), and that they are least effective for reading instruction ($\bar{x}$ = 3.38).[6] These subject matter differences are statistically significant and are displayed on Figure 4.5.[7]

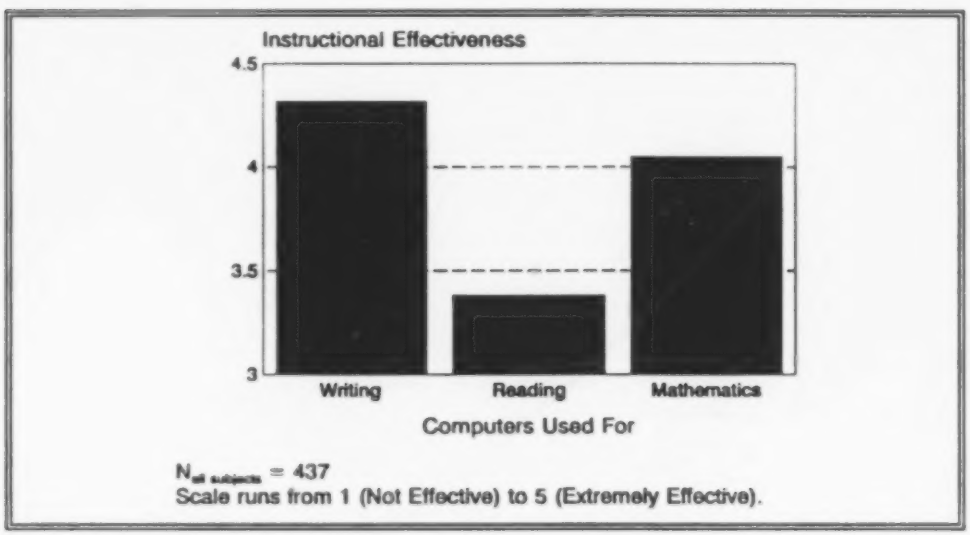

Figure 4.5: Perceptions of the Instructional Effectiveness of Computers by Secondary Teachers Actively Involved in the Educational Technology Initiative

These are, however, grade-level differences in secondary teachers' assessments of the effectiveness of computer-supported instruction. These results are shown on Figure 4.6. Secondary teachers at all grade levels believe that computers can be used most effectively in writing instruction. Teachers in grades 5-8, however, were more likely to think computers could be used more effectively to assist in the teaching of mathematics and reading than teachers in grades 9-12.

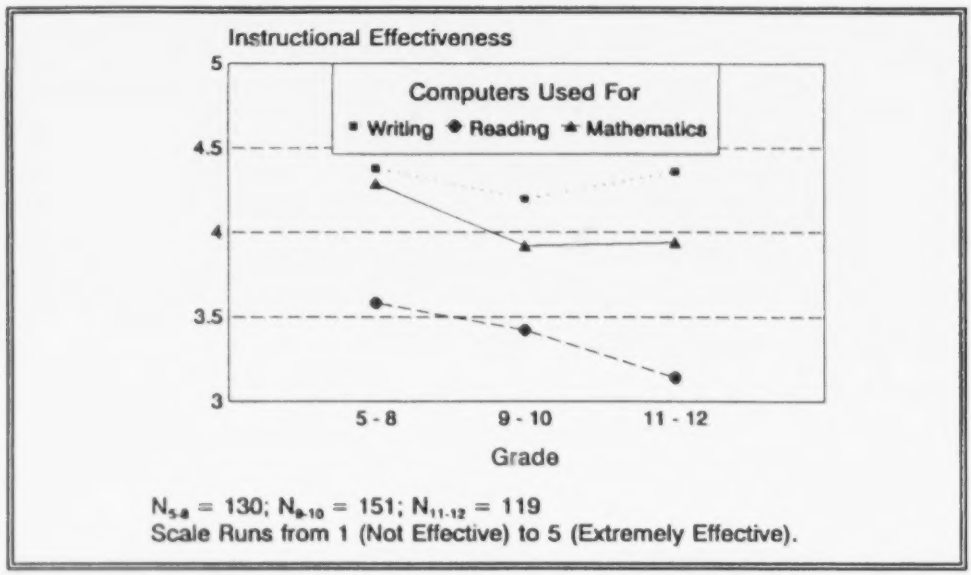

Figure 4.6: Perceptions of the Instructional Effectiveness of Computers by Secondary Teachers Actively Involved in the Educational Technology Initiative by Subject and Grade Level

These findings may also suggest a powerful relationship between teachers' beliefs and their practices. It appears Utah secondary teachers who are active computer users are using computers in the ways they currently ***believe*** to be the most effective. Changing these use patterns will require staff development that expands teachers' understanding of a variety of ways computers can be employed in teaching reading, writing and mathematics.

Beyond the Computer Lab

We asked teachers actively involved in the Educational Technology Initiative whether they used computers in their classrooms or in a computer lab. The results are reported on Figure 4.7.

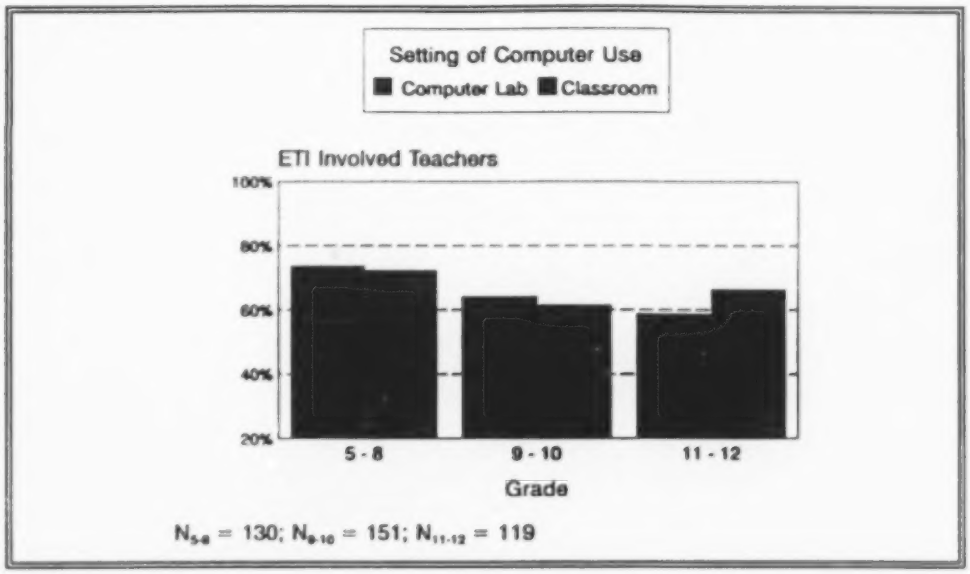

Figure 4.7: Use of Computers in Lab and Classroom Settings by Secondary Teachers Actively Involved in the Educational Technology Initiative

Unlike elementary teachers, approximately 65 percent of secondary teachers reported using computers for instruction in their own classrooms as well as the computer lab. As the grade level of the teachers increased, however, significantly fewer used the computer lab for instruction. The percentage of teachers using computers in the classroom also changed somewhat as the grade level changed. Seventy-four percent of the 5th-8th grade teachers used classroom computers for instruction compared to 62 percent of the 9th-10th grade teachers and 66 percent of the 11th-12 grade teachers.

Computers, however, can be used in a wide variety of ways. Teachers and students can use technology to communicate with other users in their own schools and users locally, nationally and internationally through networked communication systems. For example, it is possible through satellite hookups for Utah students to publish newspapers and share information with students in Europe and use a national information database to assemble information for

a written report or class project. Only 36 percent of Utah secondary teachers actively involved in the Educational Technology Initiative, however, report using computers for network communications and even fewer (15%) use laserdisc technology. One teacher in ten uses a modem for telecommunications, and one in five uses a scanner to input graphic images.

The differences between elementary and secondary equipment use are interesting. A significantly smaller proportion of secondary teachers (66%) use the computer labs favored by 81 percent of the elementary teachers and, conversely, a significantly greater proportion (67%) of secondary teachers use their classroom computers for instruction compared to elementary teachers (51%). There are no significant secondary-elementary differences with regard to the use of laserdisc players and multi-media, but significantly more secondary teachers use CD ROMS (19% vs 14%), modems (9% vs. 3%), scanners (18% vs 12%) and network communication facilities (37% vs. 27%).

Although the overall usage by secondary teachers of the more sophisticated technologies is still relatively low by absolute standards (less than 22% of the secondary teachers polled used any type of multi-media), it represents a sizable relative difference. Three times as many secondary teachers, for example, use modems, compared to elementary teachers. Nearly twice as many use scanners. There thus appears to be a small but capable group of secondary teachers attempting to use computers in ways that exploit new possibilities. These results are displayed on Figure 4.8.

There are few significant differences in equipment use by grade level.[10] A significantly greater proportion of teachers in grades 11-12 use computer labs compared to teachers in grades 5-8. Conversely, a significantly greater proportion of teachers in grades 5-8 use scanners compared to teachers in grades 9-10. This is displayed on Figure 4.9.

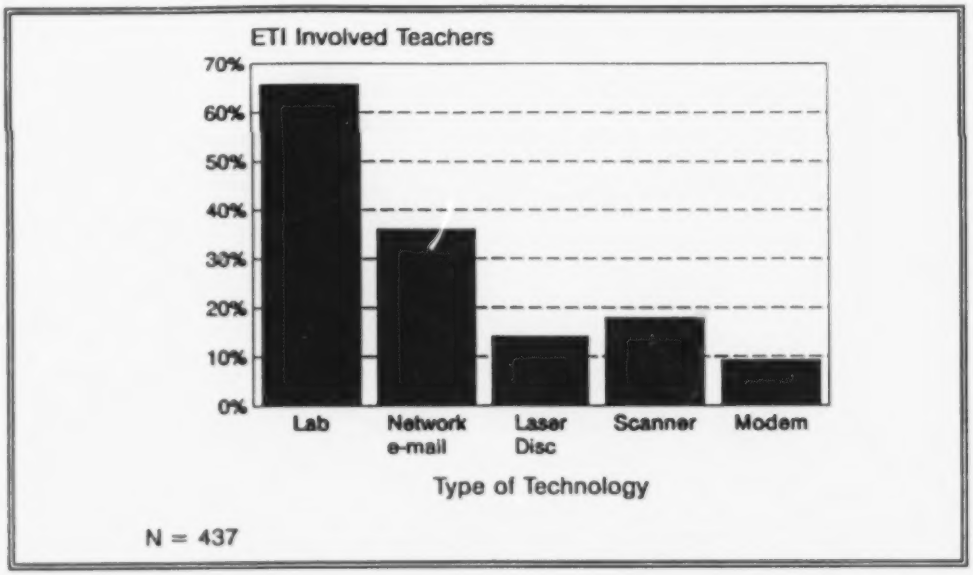

Figure 4.8: Percent of Secondary Teachers Actively Involved in the Educational Technology Initiative Using Different Types of Technology

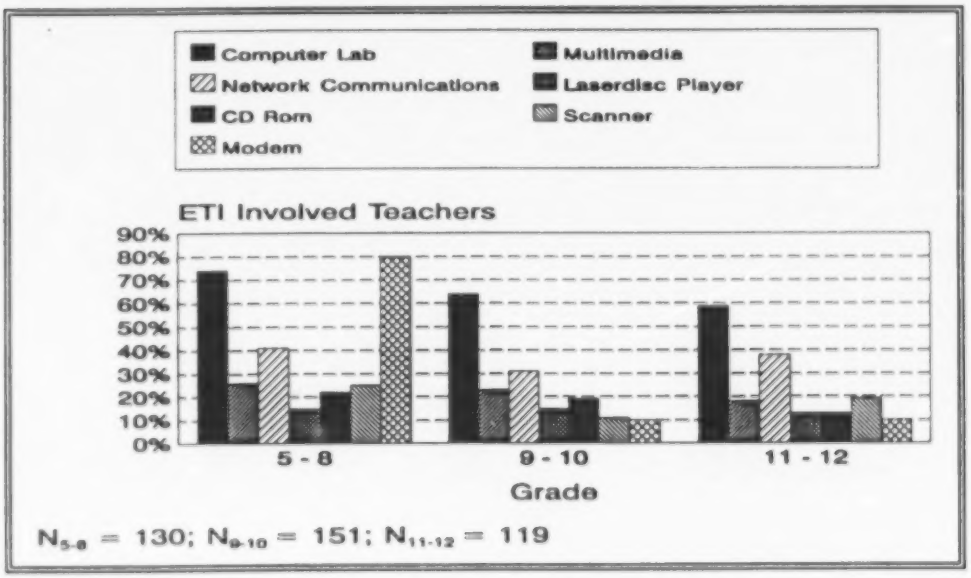

Figure 4.9: Percent of Secondary Teachers Actively Involved in the Educational Technology Initiative Using Different Types of Technology by Grade Level

Instructional Uses

The percent of Utah secondary teachers actively involved in the Educational Technology Initiative using computers for different purposes is displayed on Figure 4.10.

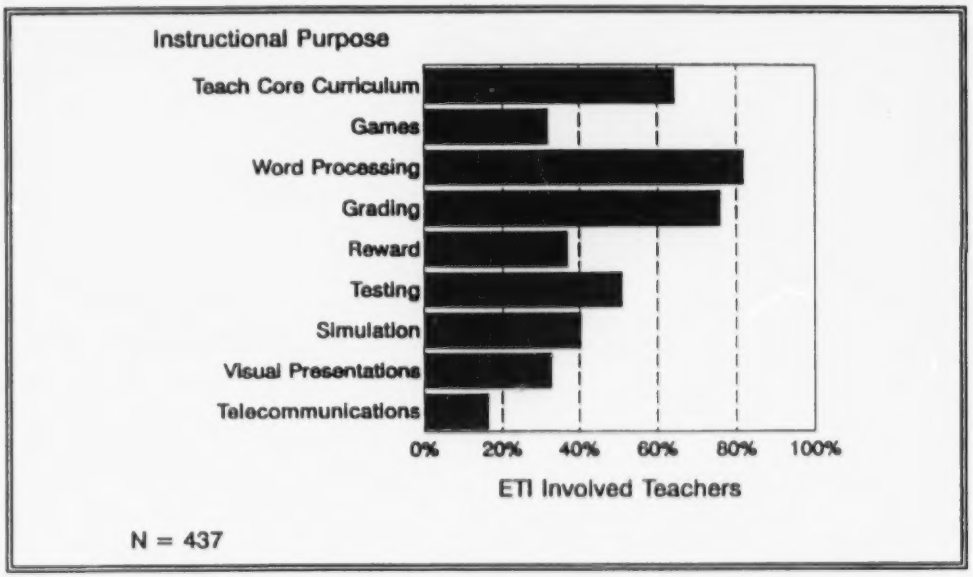

Figure 4.10: Percent of Secondary Teachers Actively Involved in the Educational Technology Initiative Using Computers for Different Instructional Purposes

Although the predominant instructional purposes are those of teaching the Utah Core Curriculum, grading and word processing, a majority of the secondary teachers (51%) also used computers for testing. Less than 40 percent of respondents reported using computers in simulations, as a reward for students, for games, or for visual presentations. Only about one secondary computer user in seven uses the technology for telecommunication or to access remote data bases.

There are significant differences in the numbers of teachers at different grade levels using computers for different instructional purposes.[11] A significantly higher proportion of teachers in grades 5-8 report using computers for games, grading, and as a reward for students who finish early or learn well compared to secondary teachers in higher grades.[12] This is displayed on Figure 4.11.

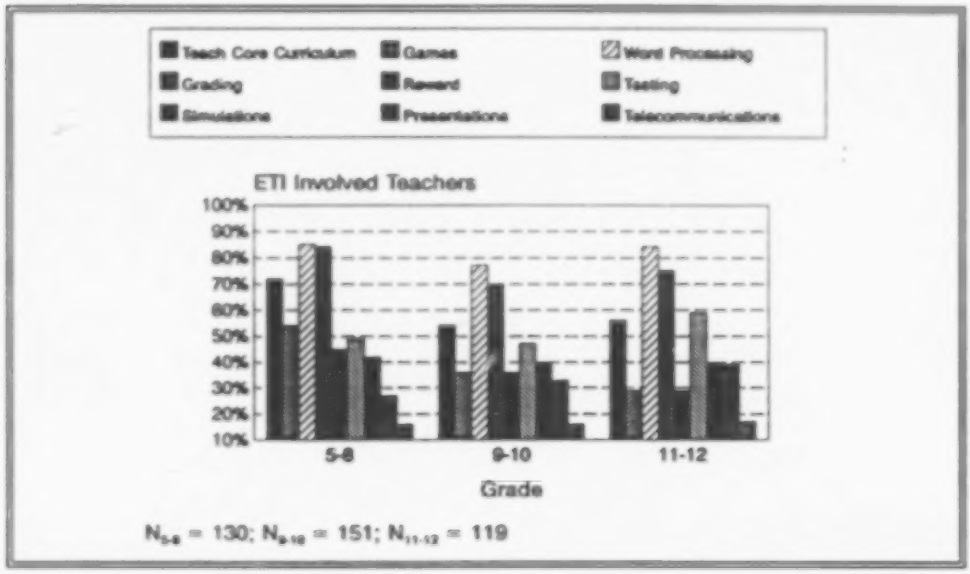

Figure 4.11: Percent of Secondary Teachers Actively Involved in the Educational Technology Initiative Using Computers for Different Instructional Purposes by Grade Level

The introduction of technology into the public schools has been viewed as an important tool for restructuring education and changing the ways teachers teach (Gifford, 1986). Previous research, however, indicates that teachers typically appropriate technology to support existing practice, using technology primarily for drill and practice in basic skills (Bork, 1980; Cole and Griffin, 1987).

Although the elementary computer users described in Chapter 2 more or less conform to this picture, secondary users report they are employing technology in more sophisticated ways. Sixty-eight percent use computers to enhance students' creativity and 65 percent use technology to enrich their lessons. Slightly less (64%) use computers to stimulate students' higher order thinking, and 59 percent use computers to introduce new concepts. Still, 60 percent use computers for classroom drill and practice, and 55 percent use the technology for remediation. This is displayed on Figure 4.12.

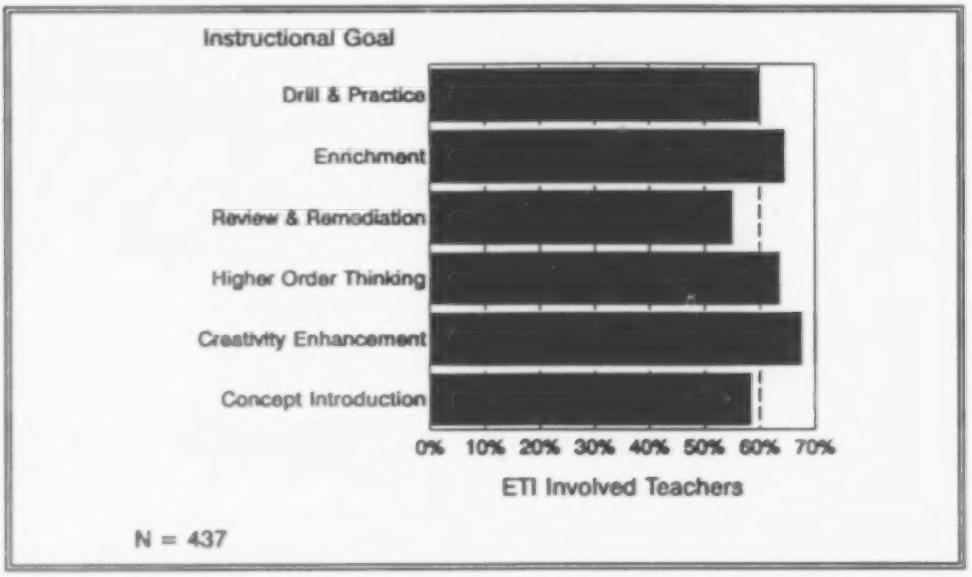

Figure 4.12: Percent of Secondary Teachers Actively Involved in the Educational Technology Initiative Using Computers for Different Instructional Goals

Taken together, these results suggest that secondary teachers are using technology for a variety of instructional goals and balancing the computer's noted ability as an electronic drill master with its ability to challenge and extend students' thinking and creativity.

There are few significant grade level differences in these results. A significantly greater proportion of teachers in grades 5-8 reported using computers for drill and practice and for review and remediation compared to teachers in higher grades. This is illustrated on Figure 4-13.

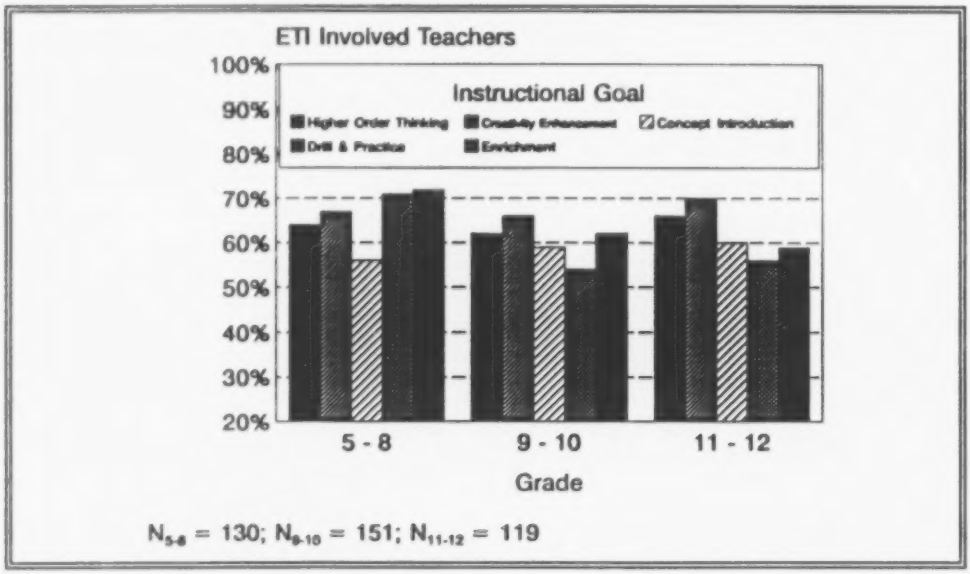

Figure 4.13: Percent of Secondary Teachers Actively Involved in the Educational Technology Initiative Using Computers for Different Instructional Goals by Grade Level

Summary and Discussion:

Technology Use in Utah Secondary Schools

The following points summarize our findings about how secondary teachers actively involved in the Utah Educational Technology Initiative have integrated technology into their instructional practices.

- From the 1987-90 school year to the 1991-92 school year, secondary teachers who were active computer users more than doubled the amount of time they used technology for instructional purposes from an average of 3.61 hours per week to an average of 7.76 hours per week. Eleventh- and twelfth-grade teachers use computers more than other secondary teachers;

- Secondary computer users use the technology considerably more to support writing and mathematics instruction than reading instruction. The proportion of teachers using computers to support writing instruction (approximately 50%) is relatively consistent across the secondary grades;

- Secondary computer users' beliefs about the instructional effectiveness of computers in different subject areas generally parallel their usage patterns. Across all grades, computers are seen as most effective for writing instruction, followed by mathematics and reading instruction. Teachers in grades 5-8, however, rate computers as more effective for reading and mathematics instruction than do secondary teachers in grades 9-12;

- Computers in classrooms or laboratories are the most frequently used type of technology among secondary computer users. Fewer than 20% of these teachers use laserdiscs, scanners, or modems;

- A majority of secondary teachers actively involved in the Educational Technology Initiative use computers for a variety of instructional goals and purposes. These include stimulating students' higher order thinking and creativity and instilling basic skills; and

- A majority of secondary teachers actively involved in the Educational Technology Initiative use computers for grading and testing, to support instruction in the Utah Core Curriculum and for student word processing. Fewer than 1 in 5 of these teachers employ the technology for telecommunications.

In general, secondary teachers actively involved in the Educational Technology Initiative are doing more to exploit the possibilities of computer technology than their elementary colleagues. The majority of secondary teachers responding to our survey use computers for drill and practice, but they also use them to introduce concepts, stimulate higher order thinking and enrich students' creativity. These are significant accomplishments, and it would seem wise to build on them. This can best be done by disseminating exemplary practices from school to school and from district to district as well as by helping all teachers achieve the skills they need to employ such exemplary practices in their own classrooms.

In short, there remains a need for further inservice and support for secondary teachers, a topic discussed in the following chapter.

Endnotes

1 To examine differences in the amount of time teachers were using computers with students, a 3 x 3 Analysis of Variance (ANOVA) was performed. Grade Level (5-8, 9-10 and 11-12) was used as a between subjects factor and years (1989-90, 1990-91 and 1991-92) was a within subject factor. The dependent measure was the number of hours per week a teacher reported using computers for instructional purposes. The wide range of hours of use reported by teachers contributes to the relatively high standard deviations and ms_e terms.

2 A main effect was found for Years, F (2,868) = 128.88, p <.001, ms_e = 14.47. This result indicates that the number of hours per week which teachers typically used computers for instructional purposes increased significantly from 1989 to 1992. Teachers typically used computers for an average of 3.61 hours in 1989-90 (SD = 6.68), 5.46 hours in 1990-91 (SD = 7.92) and 7.76 hours in 1991-92 (SD = 9.20). Student-Newman-Keuls post-hoc analysis showed significant differences between 1989-90 and 1990-91 (p <.01) and between 1990-91 and 1991-92 (p < .01).

3 The Grade Level X Years interaction reached significance, F(4, 868) = 2.38, p <.05, ms_e = 14.47. This result indicates that usage increased differentially based on grade level (see means table below). Student-Newman-Keuls post-hoc analysis revealed that for the 1989-90 school year, the 11th-12th grade group was using computers for significantly more hours than was the 9th-10th grade group. During the 1990-91 school year, there were no significant differences between the groups. By the 1991-92 school year, grades 11-12 were using computers for significantly more hours than both 9th-10th grade teachers (p <.01). and 5th-8th grade teachers (p <.05).

The 9th-10th grade group also showed a significant increase from 1989-90 to 1990-91 (p <.01) and a significant increase from 1990-91 to 1991-92 (p <.01). For teachers in the 5th-8th grade group, there was a significant increase from 1989-90 to 1990-91 (p <.01) and a lesser, though still significant, increase from 1990-91 to 1991-92 (p <.05).

Years	Grade Level		
	5-8	9-10	11-12
1989-1990			
M	3.56	2.90	4.36
SD	6.52	5.92	7.60
1990-1991			
M	5.23	4.97	6.17
SD	7.99	7.28	8.48
1991-1992			
M	6.67	7.55	9.07
SD	8.50	8.88	10.20

Number of Hours Per Week Which Teachers Actively Involved in the Educational Technology Initiative Used Technology for Instructional Purposes

4 To examine differences in teacher reports of computer use in different subjects, a 1 x 3 Kruskal-Wallis nonparametric Analysis of Variance was performed. Grade Level (5-8, 9-10 and 11-12) was used as a between subjects factor. Teachers' responses to questionnaire items on whether they used computers to teach each of the individual subjects (writing, reading and mathematics) were used as dependent measures.

5 The analysis for writing showed no significant differences between the secondary groups ($H = 1.5341$, $p > .4$).

A main effect was found for reading ($H = 3.7282$, $p < .05$). The grade 9-10 group had the highest mean rank (207.86) followed by the grade 5-8 group (207.65) and the 11-12 group (183.35). A Mann-Whitney test for 2 independent samples was used to examine the differences between the individual grade groupings. This test revealed that there were no significant differences between the 5th-8th grade group and the 9th-10 grade group. There were, however, significantly more positive responses in the grade 9-10 group (% affirmative responses = 23, mean rank = 142.79) than the grade 11-12 group (% affirmative responses = 11, mean rank = 142.79) ($Z = -7883.5$, $p < .01$).

The analysis for mathematics also showed no significant differences between the secondary groups ($H = 2.1319$, $p > .3$).

Finally, the Wilcoxon test for two related samples was used to examine differences between the subjects (writing, reading and mathematics) at each of the grade levels. At the 5th-8th grade level: computers were used for writing instruction by more teachers than for reading instruction ($Z = -4,6770$, $p < .001$); there were no significant differences between the percentage of teachers who used computers for mathematics instruction and those who used them for writing instruction ($p > .1$); computers were used for mathematics instruction by more teachers than for reading instruction ($Z = -3.2667$, $p < .01$). At the 9th-10th grade level: computers were used for writing instruction by more teachers than for reading instruction ($Z = -5.8119$, $p < .001$); computers were used for writing instruction by more teachers than for mathematics instruction ($Z = -2.6980$, $p < .01$); computers were used for mathematics instruction by more teachers than for reading instruction ($Z = -1.9561$, $p < .05$). At the 11th-12th grade level: computers were used for writing instruction by more teachers than for reading instruction ($Z = -5.5954$, $p < .001$); there were no significant differences between mathematics and writing ($p > .30$); computers were used for mathematics instruction by more teachers than for reading instruction ($Z = -3.6924$, $p < .001$).

Subject	Grade Level		
	5-8	9-10	11-12
Writing	52.3	56.3	48.7
Reading	23.1	23.2	10.9
Mathematics	43.1	35.1	36.1

Percent of Teachers Actively Involved in the Educational Technology Initiative Using Technology by Subject and Grade Level

6 To examine differences in the effectiveness of computers in supporting the teaching of writing, reading and mathematics, a 3 x 3 Analysis of Variance (ANOVA) was performed. Grade Level (5-8, 9-10 and 11-12) was used as a between subjects factor and Subject (Writing, Reading and Mathematics) was a within subject factor. The dependent measure was the rating which teachers gave for each subject (1 = Not Effective, 2 = Somewhat Effective, 3 = Effective, 4 = Strongly Effective, 5 = Extremely Effective).

7 A main effect was found for Subject, $F(2, 462) = 92.40$, $p < .001$, $ms_e = 0.57$. Teachers rated computers as most effective in writing instruction ($M = 4.32$, $SD = .88$) followed by mathematics ($M = 4.05$, $SD = 1.00$) and reading ($M = 3.38$, $SD = 1.08$). Subsequent Student-Newman-Keuls post-hoc analysis showed the mean for mathematics to be significantly higher than the mean for reading ($p < .01$).

8 The Grade Level X Subject interaction reached significance, $F(4, 462) = 2.43$, $p < .05$, $ms_e = 0.57$. This result indicates that teachers rated the effectiveness of the subjects differentially based on grade level (see means table below). Student-Newman-Keuls post-hoc analysis showed that in grades 5-8, teachers felt computers could be more effective for instruction in writing and mathematics than for instruction in reading ($p < .01$). For the 9th-10th grade group, writing is rated significantly higher than mathematics ($p < .05$) and reading ($p < .01$), and mathematics is rated higher than reading ($p < .01$). For the 11th-12th grade group, teachers felt computers could be more effective for instruction in writing than for mathematics ($p < .05$) and reading ($p < .01$).

Finally, teacher ratings of effectiveness for writing were not significantly different among the grade groups ($p > .05$). Mathematics was rated higher by the 5th-8th grade group than by the 9th-10th grade group and reading was rated higher by the 5th-8th grade group than by the 11th-12th grade group.

Years	Grade Level		
	5-8	9-10	11-12
Writing			
M	4.38	4.20	4.36
SD	0.84	0.95	0.84
Reading			
M	3.58	3.42	3.14
SD	1.04	1.14	1.07
Mathematics			
M	4.29	3.92	3.94
SD	0.88	1.11	1.01

Rating of Teachers Actively Involved in the Educational Technology Initiative of the Instructional Effectiveness of Computers by Subject and Grade Level

9 To examine differences in teacher reports of the type of technology they use, a 1 x 3 Kruskal-Wallis nonparametric Analysis of Variance was performed. Grade Level (5-8, 9-10 and 11-12) was used as a between subjects factor. The teachers' response to the questionnaire items on whether they used certain types of technology equipment during the 1991-92 school year was used as the dependent measure.

10 A main effect was found for computer use in a lab ($H = 6.4562$, $p < .05$). The grade 5-8 group had the highest mean rank (216.69) followed by the grade 9-10 group (197.48) and the grade 11-12 group (186.65). A Mann-Whitney test for 2 independent samples was used to examine the differences between the individual grade groupings. This test revealed that there were no significant differences between the grade 11-12 group and the grade 9-10 group or between the grade 9-10 group and the grade 5-8 group. Thus, as was indicated by the Kruskil-Wallis analysis, only the difference between the grade 5-8 group and the grade 11-12 group was significant.

An additional main effect was found for use of a scanner ($H = 9.4483$, $p < .01$). The grade 5-8 group had the highest mean rank (215.27) followed by the grade 11-12 group (201.47) and the 9-12 (187.02). A Mann-Whitney test for two independent samples was used to examine the differences between the individual grade groupings. This test revealed that there were significantly more positive responses in the grade 5-8 group (% affirmative responses = 25.4, mean rank = 151.67) than the grade 9-10 group (% affirmative responses = 11.3, mean rank = 131.82) ($Z = -3,0816$, $p < .01$).

Equipment Used	Grade Level 5-8	9-10	11-12
Computer Lab[1]	74%	64%	59%
CD ROM	22%	19%	13%
Laserdisc Player	15%	15%	13%
Multi-media	26%	23%	18%
Modem	8%	10%	10%
Scanner [2]	25%	11%	19%
Fileserver for Network Communication	41%	31%	38%

Notes: 1 5-8 vs. 11-12 comparison $p < .05$
2 5-8 vs. 9-10 comparison $p < .01$

Percent of Teachers Actively Involved in the Educational Technology Initiative Using Different Types of Technology by Grade Level

11 To examine differences in teacher reports of their instructional use of technology, a 1 x 3 Kruskal-Wallis nonparametric Analysis of Variance was performed. Grade Level (5-8, 9-10 and 11-12) was used as a between subjects factor. The teachers' response to the questionnaire item on the instructional function of the technology was used as the dependent measure.

12 A main effect was found for using computers for games (H = 17,6841, $p < .001$). The grade 5-8 group had the highest mean rank (228.69) followed by the grade 9-10 group (193.85) and the 11-12 group (178.14). A Mann-Whitney test for 2 independent samples was used to examine the differences between the individual grade groupings. This test revealed that there were significantly more positive responses in the grade 5-8 group (% affirmative responses = 53.8, mean rank = 154.15) than the grade 9-10 group (% affirmative responses = 36.4, mean rank = 129.68) (Z = -2.9250, $p < .01$). There were no significant differences between the grade 9-10 group and the grade 11-12 group.

A main effect was found for grading/record keeping (H = 7.8525, $p < .05$). The grade 5-8 group had the highest mean rank (216.69) followed by the grade 11-12 group (198.58) and the grade 9-10 group (188.07). A Mann-Whitney test for 2 independent samples was used to examine the differences between the individual grade groupings. This test revealed that there were significantly more positive responses in the grade 5-8 group (% affirmative responses = 83.8, mean rank = 151.80) than the 9-10 group (% affirmative responses = 69.5, mean rank = 131.70) (Z = -2.8017, $p < .01$).

A main effect was found for using computers as a reward ($H = 7.5500$, $p < .05$). The grade 5-8 group had the highest mean rank (217.27) followed by the grade 9-10 group (199.35) and the 11-12 group (183.64). A Mann-Whitney test for 2 independent samples was used to examine the differences between the individual grade groupings. Only the difference between the 5th-6th grade group and the 11th-12th grade group was significant.

	Grade Level		
Instructional Purpose	5-8	9-10	11-12
Teach Core Curriculum	72%	54%	56%
Games[1,2]	54%	36%	29%
Word Processing	85%	77%	84%
Grading[3]	84%	70%	75%
Reward[3]	45%	36%	29%
Testing	49%	47%	59%
Simulations	42%	40%	40%
Visual Presentations	27%	33%	39%
Telecommunications	16%	16%	17%

Notes:
1 5-8 vs. 11-12 comparison $p < .001$
2 5-8 vs. 9-10 comparison $p < .01$
3 5-8 vs. 11-12 comparison $p < .05$

Percent of Teachers Actively Involved in the Educational Technology Initiative Using Technology for Different Instructional Purpose by Grade Level

13 A main effect was found for drill and practice ($H = 9.3205$, $p < .01$). The grade 5-8 group had the highest mean rank (222.04) followed by the grade 11-12 group (191.42) and the grade 9-10 group (189.11). A Mann-Whitney test for two independent samples was used to examine the differences between the individual grade groupings. This test revealed that there were significantly more positive responses in the 5th-8th grade group (% affirmative responses = 70.8, mean rank = 153.43) than the 9th-10th grade group (% affirmative responses = 54.3, mean rank = 130.30) ($Z = -2.8289$, $p < .01$).

Instruction Goal	Grade Level		
	5-8	9-10	11-12
Drill and Practice[1]	71%	54%	56%
Enrichment	72%	62%	59%
Review and Remediation[2,3]	65%	52%	48%
Higher Order Thinking	64%	62%	66%
Creativity Enhancement	67%	66%	70%
Concept Introduction	56%	59%	60%

1 5-8 vs. 9-10 comparison $p < .01$
1 5-8 vs. 11-12 comparison $p < .05$
2 5-8 vs. 9-10 comparison $p < .05$

Percent of Teachers Actively Involved in the Educational Technology Initiative Using Technology for Different Instructional Goals by Grade Level

Chapter 5

ETI Inservice Programs for Elementary Teachers

ETI Inservice Programs for Secondary Teachers

While computers and other educational technology have the potential to be useful instructional tools, most teachers require training and support to use these tools successfully. In Chapter 3, we described the ETI inservice received by elementary teachers. In this chapter, we move up the grades and examine the results of a survey of secondary computer users regarding the length of training they received and its effectiveness, and the type of organization providing the training. We also analyze the relationship between inservice training and the use of instructional technology in the classroom.

Methodology, Limitations, and Statistical Notes

In October 1991, we distributed surveys to all 197 secondary schools receiving ETI funding. Copies of these surveys appear in Appendix A. We asked the principals of these schools to distribute surveys to two teachers in each of three grade groupings (6-8, 9-10, and 11-12) who taught mathematics or English and ***who were actively involved in the school's ETI project***. If the school enrollment was greater than the median Utah high school or median Utah middle/junior high school enrollment, we sent the principal four surveys for each grade group. Otherwise, principals received two surveys for each grade group. A total of 523 secondary teachers returned their surveys (163 6-8 teachers, 204 9-10 teachers, and 156 11-12 teachers). This represented an average of 2.7 secondary teachers per school, and a return rate of 74%.

All surveys from teachers in grades 9-12 were included in the analysis. For grades 5-8, we only included teachers who taught in departmentalized classrooms.

As with the elementary surveys discussed earlier, there are limitations to this sampling procedure. Although we surveyed all ETI secondary schools and all grade levels, and the sample of secondary schools can be assumed to be representative of ETI schools in Utah, ***the sample of teachers within schools is probably biased towards more active computer users. Inferences should not be made from these data concerning the extent of computer use by the "average" teacher.*** The following results, however, should reflect the usage patterns and attitudes of secondary teachers who actively use computers in their instruction.

The following sections describe the results of this survey in words and graphs. Where appropriate, we have also conducted statistical tests to examine differences among groups. The nature and results of these tests are described in the endnotes following this chapter. In the text of this chapter, when the word "significant" is used, it means that a statistical test was performed on the data and differences were found at the .05 level or below.

Duration of ETI Inservice Programs for Secondary Teachers

We asked secondary teachers who were actively involved in the Educational Technology Initiative to report how much inservice training that had received since September 1990, the initial year of the program. Nearly one-half (46%) of the secondary teachers reported they had received ***no*** ETI inservice training; 10 percent of teachers received less than 3 hours of training, 23 percent of teachers received 3-10 hours and 22 percent received more than 10 hours of

ETI training. These results, which closely mirror the amount of inservice received by elementary teachers, are displayed on Figure 5.1.

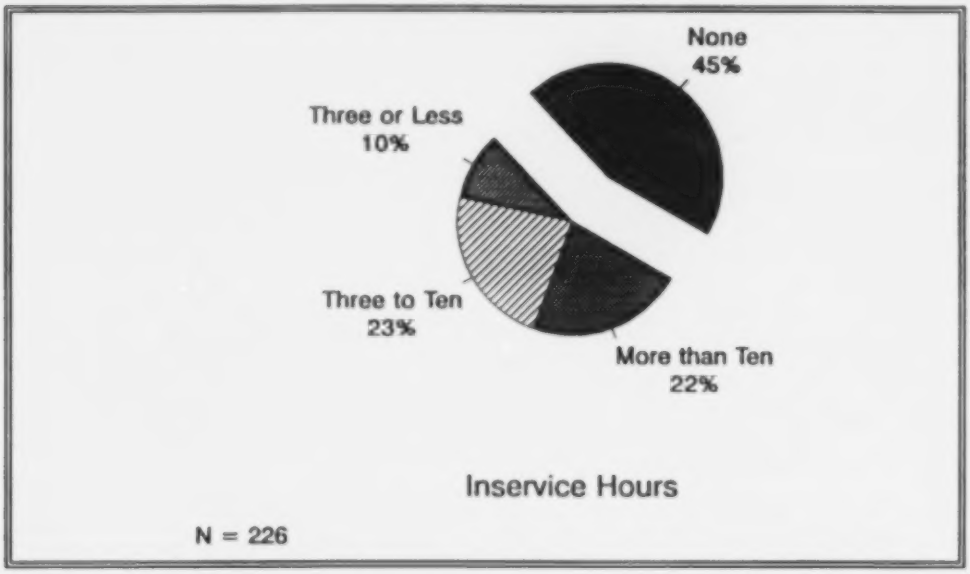

Figure 5.1: Duration of ETI Inservice Received by Secondary Teachers Actively Involved in the Educational Technology Initiative

Unlike most of the findings regarding computer usage discussed in the previous chapter, the amount of inservice reported by secondary computer users did not differ by grade level. Teachers at all secondary grade levels reported receiving minimal staff development: more than half (55%) of the secondary teachers reported receiving three hours or less of training. This finding is not surprising, since during the initial year of implementation, ETI provided no funds for staff development.

This policy is in marked contrast to standard practice in business and industry which typically allocates about 50% of funding in a technology project to training employees to use the newly installed equipment.

Although there were no grade level differences in the training received, these were subject matter differences as shown on Figure 5.2.[1] The average secondary teacher received significantly more training in writing (6.40 hours) than mathematics (4.52 hours), and significantly more training in both of these subjects than in reading (1.51 hours).[2]

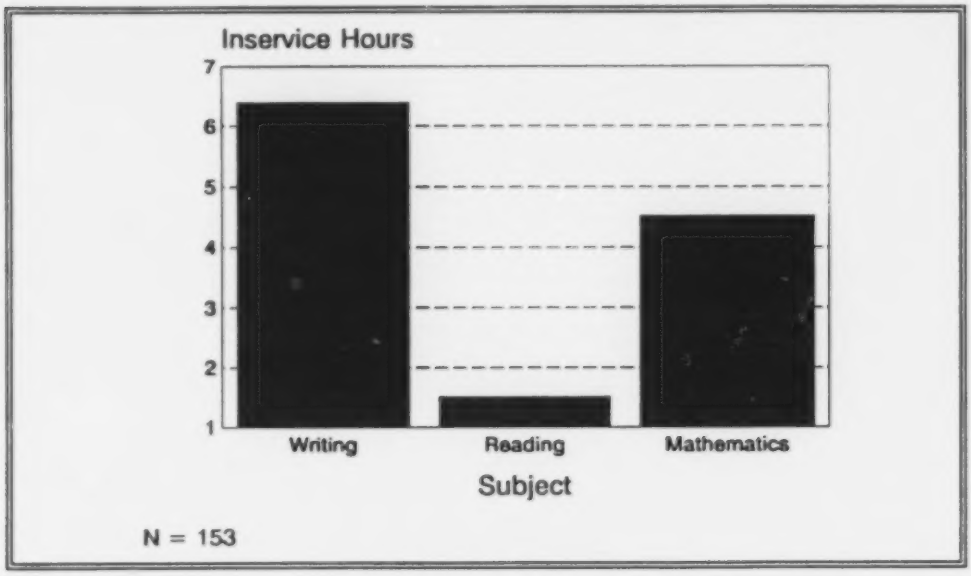

Figure 5.2: Duration of ETI Inservice Received by Secondary Teachers Actively Involved in the Educational Technology Initiative

Effectiveness of ETI Inservice Programs for Secondary Teachers

Secondary teachers involved with the Educational Technology Initiative were asked to rate the effectiveness of the training they received in each subject area using a 5-point scale, running from Not Effective (1) to Extremely Effective (5).[3] As illustrated on Figure 5.3, respondents viewed the writing inservice they received as significantly more effective than inservice training in reading,

and considered the quality of their training in writing and mathematics to be of equal quality. Although these are statistically significant differences, it must be remembered that the effectiveness rating for all subjects is numerically quite close and corresponds roughly to the scale point labeled "effective."[4]

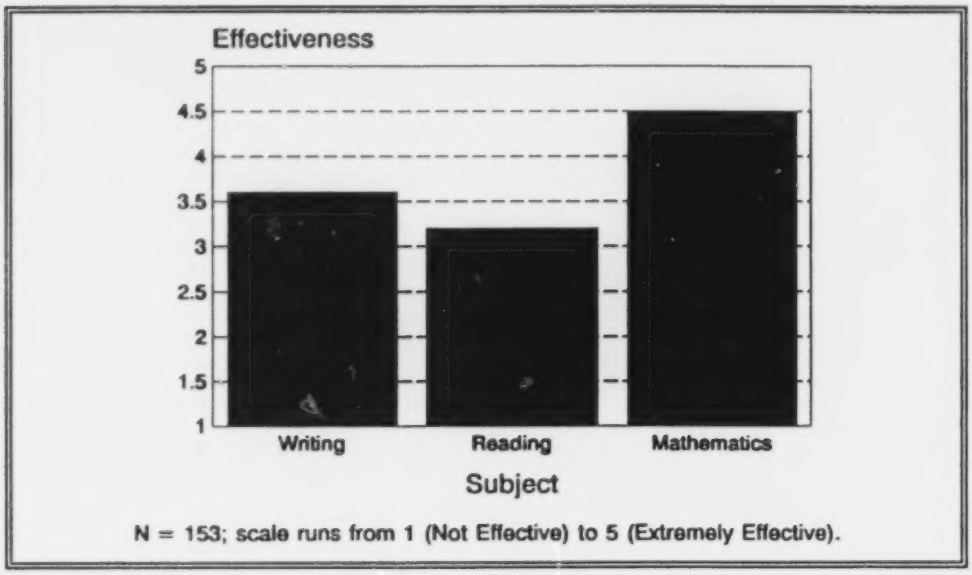

Figure 5.3: Effectiveness of ETI Inservice Received by Elementary Teachers Actively Involved in the Educational Technology Initiative by Subject

Inservice Training Providers

One of the goals of the Educational Technology Initiative was to encourage Technology vendors to make a major commitment to providing inservice for Utah's teachers. As was the case with the training provided for elementary teachers, this goal has not been met.

The majority of inservice training was done by district staff and teachers, as shown in Figure 5.4. About 63 percent of ETI training was done by district personnel and teachers with some assistance from technology vendors and

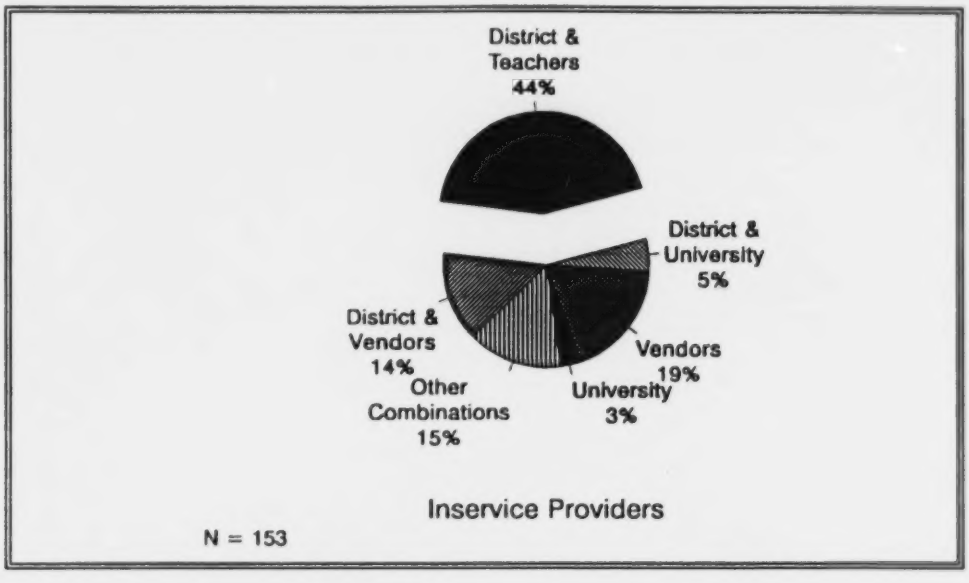

Figure 5.4: Percent of ETI Secondary Inservice Training Provided by Different Types of Organizations

university faculty. The majority of this training (44%) was provided by district personnel and teachers, 14 percent was done by district personnel in collaboration with computer vendors and about 5 percent of the training was conducted in collaboration with university faculty. These results are quite similar to those reported by elementary teachers. Vendors alone provided about 19 percent of training and university faculty alone provided only 3 percent of training.

As was the case for elementary inservice, it appears that Utah's Technology vendors and universities are not providing the massive support envisioned in the ETI legislation. Although vendors have participated in roughly one-third of the ETI inservice programs, universities have been notably absent as inservice resources for secondary teachers.

Like their elementary colleagues, the majority of secondary teachers have been left to rely on other teachers and the resources available in their own districts.

It is questionable whether these resources are sufficient to provide the intensive training and support program necessary to facilitate widespread, innovative use of educational technology in Utah secondary schools.

The Relationship of Inservice Training to Computer Use

Although many secondary teachers did not receive inservice training, a significantly higher proportion of those who did reported using computers both in the classroom and the computer lab. There was also a relationship between receiving inservice training and using CD ROM's, multi-media and network communications. This is displayed on Figure 5.5.[5]

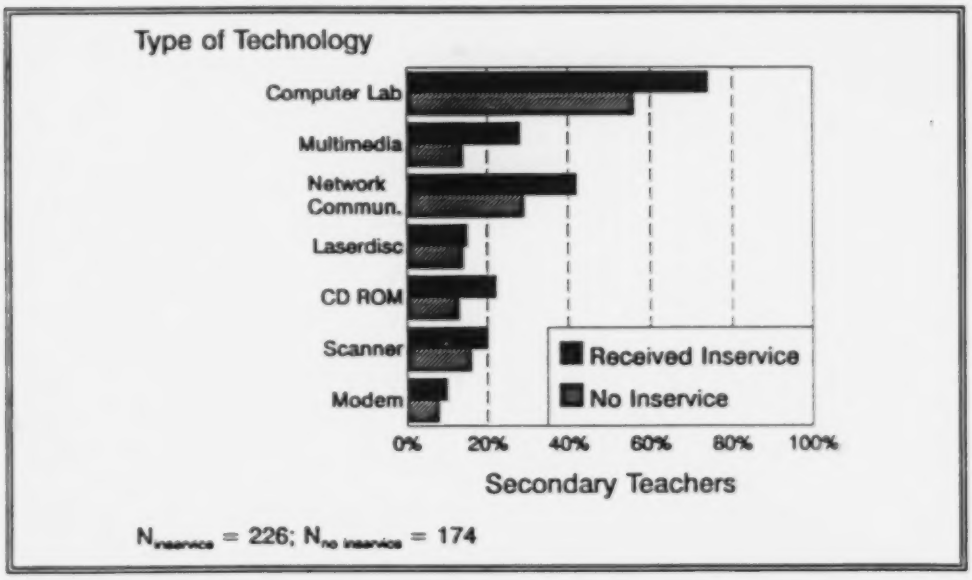

Figure 5.5: Percent of Secondary Teachers Who Did and Did Not Receive Inservice Using Different Types of Technology

Although the relationship of inservice to secondary teachers' technology use is evident, this relationship is not as extensive as was the case for elementary teachers. There was no relationship between receiving inservice and the proportion of secondary teachers using modems, scanners, or laserdisc players.

Moving from the nature of the equipment used to the nature of the use itself, we find an extensive relationship between receiving inservice and using computers for multiple instructional goals. This is illustrated on Figure 5.6.

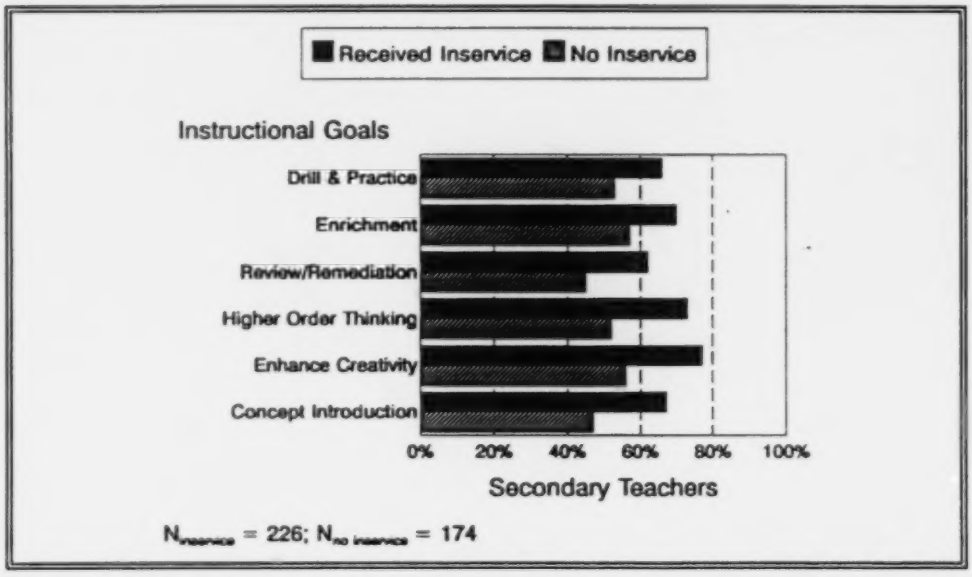

Figure 5.6: Percent of Secondary Teachers Who Did and Did Not Receive Inservice Using Computers for Different Instructional Goals

A higher proportion of secondary teachers receiving inservice used computers to help students attain both basic and higher-order thinking skills. Teachers who received inservice were also more likely to use computers to enhance students' creativity and to introduce new concepts.[o]

Finally, there was a relationship between using computers for different instructional purposes and attending inservice training.[7] A significantly higher proportion of secondary teachers who attended inservice programs used computers for grading, testing, and word processing in addition to teaching the Utah Core Curriculum. This is illustrated on Figure 5.7.

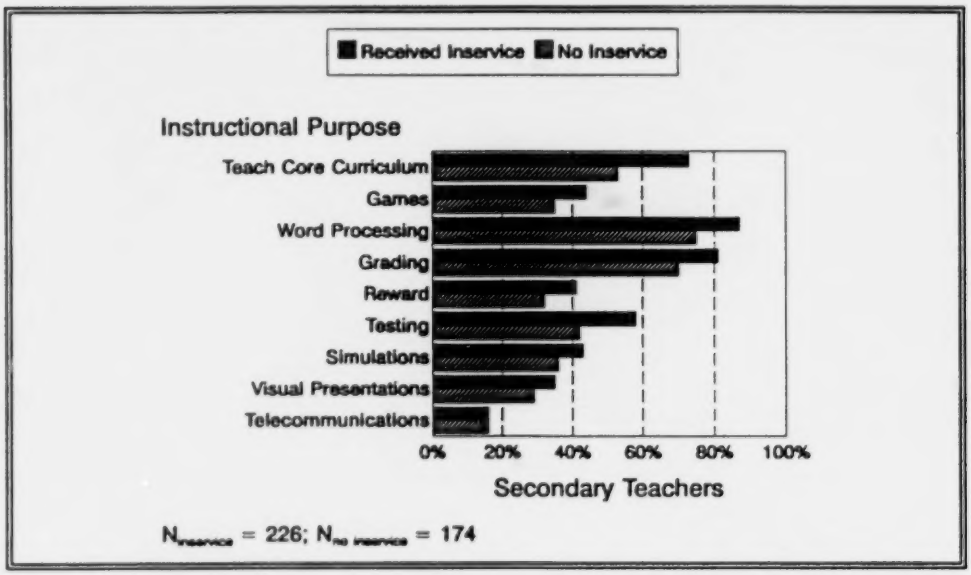

Figure 5.7: Percent of Secondary Teachers Who Did and Did Not Receive Inservice Using Computers for Different Instructional Purposes

These data demonstrate that a significantly higher proportion of secondary teachers receiving inservice training use computers and associated equipment more frequently than those not receiving training. A higher proportion of secondary teachers also use computers for more sophisticated instructional goals and purposes. These differences are striking when considered in the context of the small amount of training teachers received. The majority of the trained teachers received less than 10 hours of training. A minimal amount of training, therefore, can support significant computer usage. Whether the inservice merely provided support for teachers already committed to computer

use or whether it influenced teachers to use computers more cannot be determined from these data. What is clear, however, is that inservice training increases the instructional use and value of equipment purchased with ETI funds.

Summary and Discussion: ETI Inservice Programs for Secondary Teachers

The following points summarize our findings about the inservice received by secondary teachers actively involved in the Utah Educational Technology Initiative.

- The majority of secondary computer users (46%) received no inservice training to support the integration of technology with their instruction. Forty-five percent received three or more hours of inservice training;

- Secondary teachers involved in the Educational Technology Initiative received, on average, 6 hours of writing inservice, 4 hours of mathematics inservice and less than 2 hours of inservice in reading;

- The average secondary teacher receiving inservice training rated that training as "effective" (3) on a scale running from "not effective" (1) to "extremely effective" (5).

- Most inservice training was provided by teachers and school district personnel. This was sometimes supplemented with representatives from vendors and universities. Vendors alone provided less than 20% of ETI inservice for secondary teachers;

- Secondary computer users receiving ETI inservice were more likely to use computers for instruction more than secondary computer users not receiving inservice. ETI trained teachers were also more likely to use computers to teach both basic skills and higher-order thinking, to

stimulate creativity, to introduce new concepts, and for grading and record-keeping.

Once more we see that a majority of teachers--this time at the secondary level--did not receive any inservice training as part of the Educational Technology Initiative. Given the fact that a majority of secondary teachers actively involved in ETI report they are already using computers for sophisticated instructional goals such as stimulating higher order thinking or creativity, this lack may not seem to be a problem. There are instructional uses, however, such as telecommunications and multi-media presentations, that are employed by a relatively small minority of secondary teachers. These strategies can enhance and extend student learning, and it would strengthen Utah education if more teachers were able to employ these approaches, when appropriate, in their instruction.

Taking together the findings discussed in Chapters 4 and 5, it seems sensible to offer secondary teachers more inservice opportunities to strengthen their capabilities in more sophisticated technologies, and to establish a dissemination mechanism so that secondary teachers can learn from each other. This might be accomplished through release time made available to teachers for visiting exemplary teachers in other schools and districts. Districtwide "user groups" could also be a positive support mechanism.

Whatever the mechanism, as evaluators we believe that more attention and funds should be devoted to increasing secondary teachers' capabilities to exploit the potentials inherent in the hardware made available through the Educational Technology Initiative.

Endnotes

1 A series of matched-pairs t-tests were used to examine differences in the amount of inservice training respondents received in writing, reading and mathematics. T-tests were used because ANOVA would require data in all three of the cells (writing, reading and mathematics) and many subjects had not had inservice training in all three areas. Thus, an inordinately large number of subjects would be removed from the analysis if ANOVA were used. The matched-pairs t-tests compared: writing and reading; writing and mathematics; and reading and mathematics.

2 The analysis which compared writing and reading showed that teachers had received significantly more training in writing (M = 6.3416) than they had in reading (M = 1.5045) (t = 8.14, df = 220, $p < .001$).

The analysis which compared writing and mathematics showed that teachers had received significantly more training in writing (M = 6.4743) than they had in mathematics (M = 4.5467) (t = 2.26, df = 213, $p < .05$).

The analysis which compared reading and mathematics showed that teachers had received significantly more training in mathematics (M = 4.4886) than they had in reading (M = 1,5183) (t = -4.69, df = 218, $p < .001$).

	M	*SD*
Subject		
Writing	6.41	8.49
Reading	1.51	4.67
Mathematics	4.52	7.62

Hours of Inservice Training Received by Secondary Teachers Actively Involved with the Educational Technology Initiative by Subject

3 A series of matched-pairs t-tests were used to examine differences in the effectiveness of inservice training respondents received in writing, reading and mathematics. T-tests were used because ANOVA would require data in all three of the cells (writing, reading and mathematics) and many subjects had not had inservice training in all three areas. Thus, an inordinately large number of subjects would be removed from the analysis if ANOVA were used. The matched-pairs t-tests compared: writing and reading; writing and mathematics; and reading and mathematics.

4 The analysis which compared writing and reading showed that teachers rated their training in writing (M = 3.6596) as different from their training in reading (M = 3.3191) (t = 2.37, df = 46, $p < .05$).

The analysis which compared writing and mathematics showed that teachers did not rate their training in writing (M = 3.5208) as different from their training in mathematics (M = 3.5833) (t = -.34, df = 37, $p > .7$).

The analysis which compared reading and mathematics showed that teachers did not rate their training in reading (M = 3.2258) as different from their training in mathematics (M = 3.4839) (t = -1.68, df = 30, $p > .1$).

	M	*SD*
Subject		
Writing	3.59	1.05
Reading	3.27	1.10
Mathematics	3.53	1.16

Effectiveness of Inservice Training Received by Secondary Teachers Actively Involved with the Educational Technology Initiative by Subject

5 To examine differences in the type of technology used between teachers who did and did not receive inservice training, we divided secondary computer users responding to the survey into two groups: (1) 226 teachers who had received some type of ETI inservice training; and (2) 174 teachers who had **not** received any ETI inservice training. We performed a Mann-Whitney nonparametric test to compare differences between the two independent samples. The teachers' responses to questionnaire items on whether they used certain types of technology equipment during the 1991-92 school year was used as the dependent measure.

Respondents were significantly more likely to use computers in a lab if they had received some form of inservice training (% affirmative responses = 73.5, mean rank = 215.90) than if they had received no inservice training (% affirmative responses = 55.7, mean rank = 180.49) (Z = -3.6945, $p < .001$).

Respondents were significantly more likely to use CD ROM technology if they had received some form of inservice training (% affirmative responses = 21.7, mean rank = 207.86) than if they had received no inservice training (% affirmative responses = 13.2, mean rank = 190.94) (Z = -2.1814, $p < .05$).

Respondents were significantly more likely to use multi-media technology if they had received some form of inservice training (% affirmative responses = 28.3, mean rank = 212.64) than if they had received no inservice training (% affirmative responses = 14.4, mean rank = 184.74) (Z = -3.3215, $p < .001$).

Respondents were significantly more likely to use a fileserver for network communication if they had received some form of inservice training (% affirmative responses = 41.6, mean rank = 211.69) than if they had received no inservice training (% affirmative responses = 28.7, mean rank = 211.69) (Z = -2.6525, p < .01).

Equipment Used	Inservice	
	None	Some
Computer Lab[1]	56%	74%
Classroom Computers[1,3]	55%	75%
CD ROM [2]	13%	22%
Laserdisc Player	14%	15%
Multi-media[1]	14%	28%
Modem	8%	10%
Scanner	16%	20%
Fileserver for Network[3] Communications	29%	42%

1 no inservice vs. some inservice comparison p <.001
2 no inservice vs. some inservice comparison p <.05
3 no inservice vs. some inservice comparison p <.01

Percent of Secondary Teachers Who Did and Did Not Receive Inservice Using Different Types of Technology

6 To examine differences in teacher reports of their instructional use of technology based on whether they received inservice training, we performed a Mann-Whitney nonparametric test for comparing differences between two independent samples. The teachers' responses to questionnaire items on whether they used technology in their instruction during the 1991-92 school year was used as the dependent measure.

Respondents were significantly more likely to use technology for drill and practice if they had received some form of inservice training (% affirmative responses = 65.5, mean rank = 211.47) than if they had received no inservice training (% affirmative responses = 52.9, mean rank = 186.25) (Z = -2.5496, p < .01).

Respondents were significantly more likely to use technology for enrichment if they had received some form of inservice training (% affirmative responses = 70.4, mean rank = 212.21) than if they had received no inservice training (% affirmative responses = 56.9, mean rank = 185.29) (Z = -2.7850, p < .01).

Respondents were significantly more likely to use technology for review or remediation if they had received some form of inservice training (% affirmative responses = 62.4, mean

rank = 215.28) than if they had received no inservice training (% affirmative responses = 45.4, mean rank = 181.30) (Z = -3.3813, p < .001).

Respondents were significantly more likely to use technology for instilling higher order thinking skills in students if they had received some form of inservice training (% affirmative responses = 72.6, mean rank = 218.63) than if they had received no inservice training (% affirmative responses = 51.7, mean rank = 176.95) (Z = -4.2871, p < .001).

Respondents were significantly more likely to use technology for enhancing creativity if they had received some form of inservice training (% affirmative responses = 76.5, mean rank = 218.60) than if they had received no inservice training (% affirmative responses = 55.7, mean rank = 176.99) (Z = -4.3980, p < .001).

Respondents were significantly more likely to use technology for introducing new concepts if they had received some form of inservice training (% affirmative responses = 66.8, mean rank = 217.63) than if they had received no inservice training (% affirmative responses = 47.1, mean rank = 178.25) (Z = -3.9534, p < .001).

Instructional Goals	Inservice	
	None	Some
Drill and Practice[1]	53%	66%
Enrichment[1]	57%	70%
Review and Remediation[2]	45%	62%
Higher Order Thinking[2]	52%	73%
Creativity Enhancement[2]	56%	77%
Concept Introduction[2]	47%	67%

1 no inservice vs. some inservice comparison p <.01
2 no inservice vs. some inservice comparison p <.001

Percent of Secondary Teachers Who Did and Did Not Receive Inservice Using Computers for Different Instructional Goals

7 Respondents were significantly more likely to use technology for achieving State Core objectives if they had received some form of inservice training (% affirmative responses = 73.0, mean rank = 218.02) than if they had received no inservice training (% affirmative responses = 52.9, mean rank = 177.75) (Z = -4.1604, p < .001).

Respondents were significantly more likely to use technology for word processing if they had received some form of inservice training (% affirmative responses = 86.7, mean rank

= 210.45) than if they had received no inservice training (% affirmative responses = 75.3, mean rank = 187.57) (Z = -2.8567, $p < .01$).

Respondents were significantly more likely to use technology for grading or record keeping if they had received some form of inservice training (% affirmative responses = 80.5, mean rank = 210.06) than if they had received no inservice training (% affirmative responses = 69.5, mean rank = 188.08) (Z = -2.5394, $p < .05$).

Respondents were significantly more likely to use technology for testing if they had received some form of inservice training (% affirmative responses = 58.0, mean rank = 214.43) than if they had received no inservice training (% affirmative responses = 42.0, mean rank = 182.41) (Z = -3.1716, $p < .01$).

Instructional Purpose	Inservice	
	None	Some
Teach Core Curriculum[1]	53%	73%
Games	35%	44%
Word Processing[2]	75%	87%
Grading[3]	70%	81%
Reward	32%	41%
Testing[2]	42%	58%
Simulations	36%	43%
Visual Presentations	29%	35%
Telecommunications	16%	16%

1 no inservice vs. some inservice comparison $p < .001$
1 no inservice vs. some inservice comparison $p < .01$
1 no inservice vs. some inservice comparison $p < .05$

Percent of Secondary Teachers Who Did and Did Not Receive Inservice Using Computers for Different Instructional Purposes

Chapter 6

The Implementation and Impact of the Educational Technology Initiative on Colleges of Education

The Implementation and Impact of the Educational Technology Initiative on Colleges of Education

Introduction

In 1989, the Utah State Legislature recognized "that the quality of education can be enhanced in the state by providing for educational technology programs that . . . train teachers and prospective teachers in the state's colleges of education to effectively use educational technology in the classroom . . ." (H.B. No. 468, p. 2.) The State Board of Regents initially received $1,485,000 from this legislation and allocated the funds to the state colleges of education. The allocation to each college of education was proportional to the number of prospective teachers graduated from each college compared to the total number of prospective teachers graduated from the training programs of all Utah colleges of education in 1989-1990. For the 1990-1991 fiscal year, the appropriation for the Utah colleges of education was set by the legislature at $1,150,000; however, $13,000 of this went to the ETI Project Office and $10,000 were placed in a contingency fund. The amount dispersed to colleges was $1,127,000.

During the years 1989-90 and 1990-1991 the monies received by colleges of education for their ETI projects are displayed on Table 6.1.

The ETI legislation directed each college of education to prepare and submit a plan to the ETI Steering Committee for review and approval of the proposed use of its appropriation. Each project was to focus on training (public school) teachers and prospective teachers to use the technology which school districts may acquire through this legislation (H.B. No. 468, p. 10).

University	Allocation in 1989-1990	Allocation in 1990-1991	Total Allocations
University of Utah	$524,700	$291,893	$816,593
Utah State University	$480,100	$389,942	$870,042
Weber State University	$232,900	$226,527	$459,427
Southern Utah University	$247,300	$218,638	$465,938
Total Allocations	$1,485,000	$1,127,000	$2,612,000

Table 6.1: College of Education ETI Allocations by Year

Year One Evaluation Focus

The focus of the first year of the ETI evaluation is on technology programs functioning at Southern Utah University (SUU) and Weber State University (WSU) during the 1991-1992 school year. Studies of the implementation of the Educational Technology Initiative at the University of Utah and Utah State University will be conducted during the 1992-1993 academic year.

The purpose of this chapter is to describe ETI projects at Southern Utah and Weber State and present the perceptions of faculties, administrations, and students regarding the impact of ETI. The chapter includes information about the selection of the planning committees, the planning process, the major goals identified, and the projects and activities undertaken to accomplish the desired goals. We also describe the activities jointly undertaken by the colleges of education and neighboring school districts.

The following section describes the two universities, and then recounts the planning and implementation of their ETI projects. We then present a status report on the impact of the two ETI projects on instruction and learning.

Finally, we present some conclusions about ETI functioning and impact at the colleges of education.

Description of the Universities

Southern Utah University

Southern Utah University is located in the heart of Cedar City in southwestern Utah. Because Southern Utah is a residential campus, more than 3,000 undergraduate students mingle on the 112 acre campus, not only for their educational experience but for most of their cultural and social activities as well.

The University offers liberal arts courses leading to baccalaureate degrees in the humanities, art and sciences; professional study in teacher education, business and technology; degrees in vocational-technical and agricultural fields; and outreach and continuing education programs. More than 400 faculty teach SUU's students. To serve the needs of the nearby rural communities, SUU operates a radio station, provides programming for local cable TV, and annually presents the Utah Shakespearean Festival. The university also organizes and conducts programs for disadvantaged and handicapped youth.

Nearly 100 years ago, Southern Utah University was begun as a branch of the state's teacher training school. Started as a college to train teachers, the Department of Teacher Education is still the largest in the school with more than half of the student body registered in its classes. The teacher education program seeks to develop teachers who are academically competent in their field, have a broad general education, a belief in the dignity of the individual, a working knowledge of psychology, a working understanding of classroom management, and competency in use of technology as an instructional aid. To fulfill these and other goals, the department offers a competency based

program that emphasizes: 1) knowledge of subject matter, 2) personal characteristics which support successful teaching, and 3) teaching skills.

The administration feels that SUU has the finest teacher preparation program among Utah's state supported universities. Eighty percent of the graduates from Teacher Education find employment in the public schools where they did their student teaching. SUU graduates students from its College of Education with Bachelor of Arts, Bachelor of Science, or Master of Education degrees.

Weber State University

Weber State University is located on the Wasatch mountainside overlooking Ogden, Utah and the Great Salt Lake. The university's 400 acre campus consists of 57 modern buildings, abundant with classrooms, laboratories, computing facilities, a spacious library, and performing arts and health and fitness centers. Approximately 14,300 students are enrolled in seven colleges. Most students live in communities along the Wasatch Front. Weber State offers an undergraduate liberal education in the arts, humanities, natural and social sciences, plus vocational and professional programs in health professions, business, education, applied sciences, and technology.

WSU's Department of Teacher Education is presently providing preparation curricula to approximately 1,255 education majors. It also conducts inservice courses for practicing public school teachers. Together, these students constitute approximately nine percent of the university's enrollment. WSU graduates students from its College of Education with a Bachelor of Arts, Bachelor of Science, or a Master of Education degree.

Weber State aspires to be Utah's collaboration leader with elementary and secondary schools to improve education and teaching. Prior to ETI, eleven

alliances had been organized to link WSU faculty and school teachers in fields such as the sciences, history, mathematics, geography, foreign languages, performing arts, and English. A new model for training secondary teacher candidates on location in local schools has been piloted. Prospective teachers were placed in a public school for two college quarters of coursework and student teaching in English classes. Three WSU professors traveled to the schools on a daily basis to provide related core instruction to student teachers. This allowed candidates to apply newly learned concepts while practice teaching for the remainder of the day. Weber State is presently piloting a second phase of this program that includes history as well as English. The intent is to eventually include all prospective secondary education teachers.

Another program, which promotes college enrollment, is an Early College project that provides opportunities for high school seniors to gain up to a year's worth of college credit while finishing high school.

ETI Project Planning and Implementation

Southern Utah University

The goal of the ETI project conducted by the Department of Education at Southern Utah University was to implement a multi-phase four-year program preparing practicing and prospective teachers to "incorporate microcomputers and other technologies into their instructional programs." Initial objectives included:

- establishing a centralized computer lab for use in teacher training;
- developing and integrating curriculum components into teacher education coursework;
- training SUU faculty on instructional use of microcomputers;

- providing inservice training for public school teachers; and
- evaluating the effectiveness of SUU's ETI project.

SUU's ETI proposal was put together by a committee comprised of representatives from each department that had a direct impact on teacher education, including Library Science, Physical Science, Industrial Education, Business and Teacher Education. This arrangement is illustrated on Figure 6.1. This committee sought input from other university departments, from the campus-wide computer director, from Iron School District ETI staff and from local area school district superintendents.

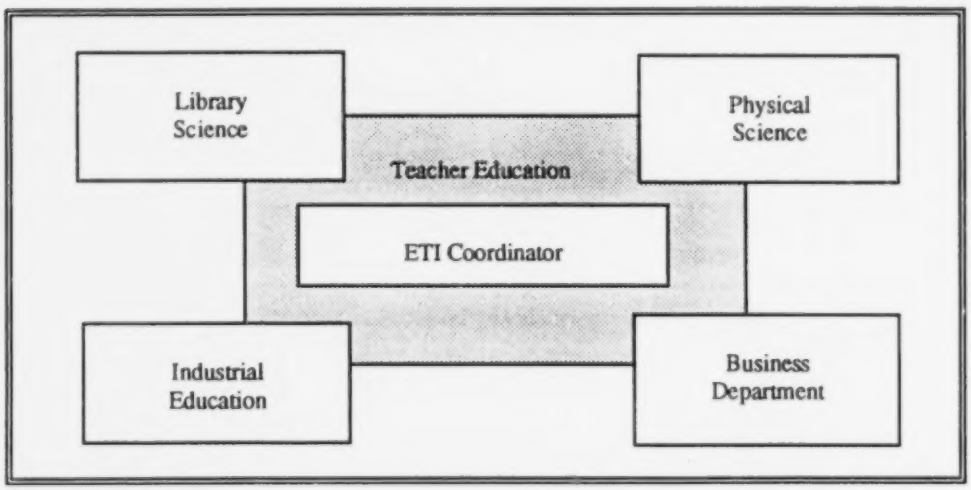

Figure 6.1: Southern Utah University ETI Planning Committee

Anticipating the approval by the legislature of funding for ETI, the College of Education created a new position with the responsibility to manage the SUU ETI project and to teach technology courses. An educator with technology experience as well as teacher education experience was hired and appointed ETI Coordinator and Chair of the Planning Committee.

During year one (1990-1991), the plan called for:

- Establishing a centralized microcomputer lab in the Department of Teacher Education;
- Linking the Department of Teacher Education with the campus-wide computer network;
- Networking teacher education faculty workstations;
- Procuring and installing video technology for micro-teaching;
- Providing initial training and follow-up technical support for SUU faculty on the instructional use of microcomputers;
- Providing inservice training for public school teachers in areas essential to the accomplishment of school district ETI goals; and
- Evaluating the effectiveness the ETI project.

Before the Educational Technology Initiative, the College of Education did have a computer lab, but it was limited in its capabilities. It consisted of five Apple IIe workstations used most frequently for word processing. As a result, computer usage in the department was very low.

SUU spent its initial allotment of ETI funds to procure computer hardware, computer enhancement equipment (such as laser disc players and a large screen projector), computer software and computer tables and chairs. Matching monies from SUU were spent primarily on the procurement and installment of signal transmission cable for interactive networking purposes. A former video studio and classroom in the education building was converted into a computer lab that provided convenient technology access for teacher education. Twenty four new Mac workstations, a fileserver, and state-of-the-art technology for teacher presentations were purchased with ETI funds and installed in the lab.

Some ETI-funded equipment was added to the university library to facilitate the acquisition of information by the students, and numerous PC's have been located in a special lab within the university library for student use. In addition, every teacher education instructor received a personal computer (PC). These PC's were installed in faculty offices and connected to the university computer network.

The primary use of the lab is for teacher education classes. The College of Education offers a course called Technology and Teaching as part of the teacher education program. Though not a required course, it is strongly suggested that potential teachers enroll. Utah licensing regulations require all prospective teachers to demonstrate competence in technology use before receiving a teaching credential. The Technology and Teaching course is designed to help teachers integrate technology into the curriculum. Other classes, where technology is being used to support instruction, and that stress teaching methods, are taught in the lab by instructors from the math and home economics departments.

During afternoons the lab is maintained as an open lab so that any student may use the equipment. In addition, workshops, demonstrations, and inservice classes for university faculty and local area school teachers are held frequently. The lab is also used evenings and Saturdays. According to the Lab Utilization Log, over a five month period, from October 23, 1991 through March 26, 1992, the lab accommodated 29 groups with an average size of 24 for an average length of more than 2.6 hours.

SUU has been working with two local school districts to make university information resources available to high schools. Iron School District and SUU cooperatively purchased and installed the necessary technology to network Cedar City High School and the university. This link allowed high school

teachers and students to access the greater amounts of materials and information housed at the university library.

Through an inter-university computer networking system, Cedar City High students can access information from other universities throughout the country as well. Though the link between the high school and SUU was completed with only two months left in the 1991-1992 school year, some 100 students (three classes) at Cedar City High were able to learn how to operate the system and did access some needed materials.

Beaver High School in Beaver School District is presently installing a link to SUU to be able to access the university's library materials.

Weber State University

To prepare the Educational Technology Initiative plan at Weber State University, the College of Education assembled a committee with broad representation, as illustrated on Figure 6.2.

The Dean of the College of Education chaired the computer committee, which was originally comprised of members from the Department of Teacher Education. The Dean of the College of Education also serves as the ETI Coordinator. The committee expanded to include the campus-wide Computer Director and several representatives from departments within and outside of the College of Education. In addition, five local school district ETI coordinators were invited to participate.

The committee decided that Weber's technology initiative would focus on four major goals:

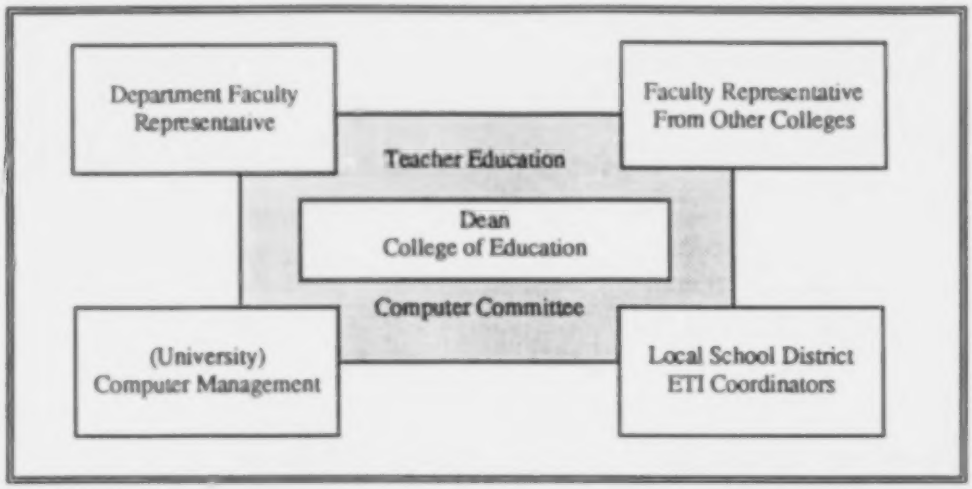

Figure 6.2: Weber State University ETI Planning Committee

- Increasing the use of computer-assisted instruction (CAI) by educators at Weber;
- Establishing a support system to assist instructors who use CAI
- Providing teachers in near-by school districts with access to examples of computer assisted instruction for use in their classrooms;
- Assisting with local school district ETI evaluations.

Weber planned to increase interaction with public schools and develop a clearing house for their technology projects, as well as implement technology enhanced instruction throughout the College of Education. In order to assist schools with their technology projects, WSU would increase liaison activities with the districts, and encourage faculty to guest teach in local schools. In addition, WSU would provide inservice to teachers, and facilitate the use of college technology expertise and university-developed instructional software within schools. The college would develop a center to provide information on technology applications to educators to support the desired focus on technology enhanced instruction. In addition, WSU intended to develop a model

classroom, called the "Technology Enhanced Classroom" or TEC, to provide preservice instruction for teacher candidates.

Weber administrators reported that the institution possessed a considerable amount of technology recently purchased, but procured before ETI funds were made available. They indicated that the university could have more effectively spent its allocated funds had it been allowed to use more of the funds for purposes other than to purchase hardware and software. Though the initial ETI allotment was spent mostly on hardware, it was spent to implement a rather new use of an old concept. Ten mobile teaching stations were procured costing approximately $10,000 each. Each station included a Mac SI computer, CD-ROM, laserdisc, and an LCD projection plate and overhead projector for large screen viewing, all mounted on a sturdy moveable cart. These stations increased availability of state-of-the-art presentation technology for interested instructors.

Prior to ETI, Weber State had several computer labs scattered across the campus. These labs were networked, so students could go to the most convenient lab to do their work. The lab in the education building had available the same equipment that instructors used for presentations, as well as about fifty computer workstations. All of this technology was free for student use.

Once the ETI funds were available, additional technology equipment was purchased to create the new Technology Enhanced Classroom for demonstration purposes. According to WSU faculty, additional equipment is still needed to make TEC suitable for effective demonstrations. ETI funds also have been used to procure hardware and software for the professors in academic departments that provide teacher education instruction and the development and testing of instructional materials for student use. WSU was

able to expand its collaboration efforts with local area school districts from 11 to 13 by developing joint ETI alliances with Weber and Ogden School Districts.

The partnership with Weber School District implemented a new math project. As part of ETI, WSU's College of Education provides inservice support to the school district for a computer-assisted math program called WeMath. WeMath can be down-loaded via modem from WSU by teachers and other school personnel. Approximately 40 teachers have been trained to write software, and have produced more than 400 software programs. These programs are being used in 25 elementary school computer labs and 36 math teaching workstations in secondary schools. One of the WeMath implementation specialists, who has helped conduct 200 training workshops for some 600 teachers using these programs, receives half of her salary from Weber State.

The alliance with Ogden supports integration of technology into the curriculum at Mound Fort Middle School. During the 1990-1991 school year the College of Education provided a training program for the teachers at Mound Fort Middle School in Ogden School District. Teachers were trained in the effective integration of technology into the curriculum. Training sessions were conducted three times per week over much of the nine-month period.

Finally, two satellite weather tracking stations have been purchased to be used at two junior high schools in Weber School District. WSU is providing the inservice training for teachers and the satellite receiving capability for the project with ETI funds.

Data Collection Methodology

The methodology used to evaluate ETI activities at Southern Utah University and Weber State University followed the concept of portfolio analysis. Diverse types of data collection methods including observations, interviews and surveys were used to gather opinions and perceptions of those directly involved in the projects. Included were administrators, the ETI coordinators, education department instructors, those providing technical support, the students impacted at each university, and personnel from local public schools.

Information concerning project background and implementation activities was sought as well as opinions and feelings about the impact of ETI. We explored four major issues regarding ETI:

- What have been the effects of the Educational Technology Initiative on the quality of instruction in the College of Education?
- What have been the effects of the Educational Technology Initiative on student learning?
- What have been the level and quality of instructor training on how to effectively use the new ETI technologies?
- Has the technology been accessible for student use as needed?

To gather data on these questions, we designed the following instruments which appear in Appendix A:

- An Oral Interview Guide to solicit administrators' perceptions of the impact of ETI. After answering 20 pre-specified questions, administrators were encouraged to reflect on ETI and make additional comments. Each interview lasted between forty-five minutes and one hour.

- A survey to measure university instructors' attitudes toward ETI. Instructors were asked to indicate to what degree they agreed or disagreed with 25 statements concerning ETI. These statements covered four general areas: 1) attitudes toward computers and computer-supported instruction; 2) training received to integrate computers in instruction; 3) the impact of computers on student learning; and 4) computer support, maintenance and facilities. Sample items included: "Computers have the potential to greatly improve education;" "The training did not give me sufficient concrete ideas about how to integrate technology in my curriculum;" "Students can learn material in less time using computers;" and "I receive the computer program help and support I need from administrators and technical support staff." The survey ended with a section for additional written comments.

- A survey to measure university students' attitudes toward ETI. Students were asked to indicate to what degree they agreed or disagreed with 20 statements concerning ETI. These statements covered the same general areas as the instructors' surveys. Sample items included: "I am eager to learn more about how I can use computers to teach effectively;" "I have not received sufficient training on how to use computer technology effectively;" "Using computers increases my motivation to learn;" and "Sufficient computers are available at this university for student use to allow me to use one when I need it." The survey concluded with a section for additional written comments.

- An observation checklist for reviewing the use of technology in classrooms, laboratories and other facilities. The checklist contained guidelines for observing technology usage by students and instructors, equipment configurations, and technology environments.

Southern Utah University

At SUU interviews were conducted with the Dean of the College of Education, the Chair of the Department of Teacher Education, the ETI Coordinator, the Director of Computing Services, the Library System Administrator, and a professor from the math department. At the invitation of the ETI Coordinator, a representative from the Iron School District was interviewed as well.

Instructor survey forms were distributed to the 12 instructors in the Department of Teacher Education. All 12 were completed and returned. Student survey forms were passed out to students enrolled in classes where ETI technology was being utilized. Classes were carefully selected to prevent students filling out duplicate forms. Sixty student forms were completed which represents better than 10% of the students who were taking classes from Department of Teacher Education instructors.

Weber State University

At WSU interviews were conducted with the Dean of the College of Education, the Chair of the Department of Teacher Education, the ETI Coordinator, and the Director of Computing Services. At the request of the Dean of the College of Education, visits were made to Box Elder, Weber, Ogden, Morgan and Davis School Districts offices. The ETI coordinators of these districts were interviewed. Additional informal interviews conducted at the sites focused on Weber State ETI project activities as they related to each specific district.

Instructor survey forms were distributed to the 28 instructors in the Department of Teacher Education at WSU. Fourteen forms were completed and returned, a 50% response rate. Student survey forms were passed out to students enrolled in classes where ETI technology was being utilized. Again,

classes were carefully selected to prevent students filling out duplicate forms. Eighty-nine student forms were completed, representing 7.1% of the students enrolled in education courses.

Two beginning technology classes were selected for observation, and a tour of facilities was conducted to observe applications and use where ETI technology had been installed.

Evaluation Results

Because ETI projects at SUU and WSU are very much in the middle of the development process, this chapter was not written as a summative report. It is but a snapshot of the present status of the two university projects.

Southern Utah University

ETI Impact as Perceived by Administrators. Interviews with seven SUU administrators yielded a positive portrayal of ETI as indicated on Table 6.2. When asked to what degree they felt that ETI had enabled instructors to develop more creative and effective lessons, 71 percent said "substantially" and 14 percent said "exceptionally." Forty-three percent indicated that ETI had improved instruction "substantially" and another 43 percent said "exceptionally." ETI was also credited with increasing instructor's skills in tracking student progress and diagnosing weaknesses, although this impact was not of the same magnitude as ETI's instructional impact.

Item	Percent Responding				
To what degree has ETI:	Not at All	Slightly	Moderately	Substantially	Exceptionally
Enabled instructors to develop more creative and effective lessons?		14%		71%	14%
Improved Instruction?		14%		43%	43%
Increased instructors' skills in tracking student progress and diagnosing weaknesses?		33%	33%	33%	
Improved inservice teacher training in technology?		17%		33%	50%
Encouraged collegial support among faculty?			17%	17%	67%
Provided time for instructors to master the basics of the technology?		40%	20%	40%	
Provided equal access to technology for all students and instructors?			14%	29%	57%
Had a demonstrable effect on teacher effectiveness?		20%	60%	20%	

Notes: N = 7; percentages may not sum to 100% because of rounding.

Table 6.2: Southern Utah University Administrators' Perceptions of Educational Technology Initiative Impact

Had ETI improved inservice teacher training in technology? Thirty-three percent of the administrators said "Substantially" and 50 percent said "exceptionally." ETI was also perceived as strongly facilitating collegial support among faculty. SUU Administrators' opinions were divided, however, when asked whether ETI provided time for instructors to master the basics of technology: 40 percent responded "slightly," and 40 percent responded "substantially."

When asked whether the ETI project provided equal access to technology for instructors and students, 29 percent said "substantially" and 57 percent said "exceptionally."

Finally, the majority (60%) of SUU administrators felt that ETI had a moderate impact on instructors' overall effectiveness.

ETI Impact as Perceived by Instructors. Twelve SUU instructors completed the survey, and were also positive in their attitude toward ETI, as shown on Table 6.3. The instructors felt that the initiative was having an affirmative impact and has enabled them to improve the quality of their instruction. Eighty-three percent felt that they were using the new technologies creatively in their instruction, and students were learning more by using computers.

Nearly all of the instructors (91%) felt they taught more effectively when they were using computers, and slightly fewer (75%) felt that computer-managed instruction was as effective as traditional instruction.

There was complete agreement that technology enhanced courses should continue.

Item	Percent Responding				
	Strongly Agree	Agree	Undecided/ Not Sure	Disagree	Strongly Disagree
I am able to use computers creatively in my instruction.	25%	58%	18%	58%	
By using computer technology in my classes, I have increased my students' subject matter learning.	25%	58%	17%		
I can teach as effectively using traditional methods as I do when I use computers.			9%	55%	36%
Instruction managed by computers is as effective as instruction presented by traditional instructors.	42%	33%	17%	8%	
The technology enhanced courses currently being taught should continue as part of our curriculum.	83%	17%			
A quality training program on computer use has been made available to all department staff.	42%	58%			
I have not received sufficient training on how to use our computer technology effectively.	8%	42%		25%	25%
Students are able to use a computer whenever they have a need.	42%	42%	17%		

Notes: N = 12; percentages may not sum to 100% because of rounding.

Table 6.3: Southern Utah University Faculty Perceptions of Educational Technology Initiative Impact

All 12 instructors agreed that there was a quality training program available to them, but half of them said they had not received sufficient training to enable them to become as proficient as needed.

The majority of instructors (84%) felt sure computers were available to all students needing one.

ETI Impact as Perceived by Students. We surveyed 60 SUU students enrolled in the College of Education to determine their feelings about ETI. They, too, were positive in their feelings that computer use at the university improved the quality of instruction and student learning. These perceptions are displayed on Table 6.4.

Ninety-eight percent of the students were eager to learn how to use computers to teach effectively, and a majority (72%) felt they learned more when they used computers. Eighty-six percent of the students agreed that their instructors used computers creatively; just over one-half (51%) believed that computer-managed instruction was as effective as that presented by teachers.

Student opinions were divided about whether they had received sufficient training to effectively integrate computers into their curriculum: Students were in general agreement that computers should be used to support instruction and learning and that investments in computer technology were a wise use of funds.

While 51 percent of students felt that enough computers were available for their needs, a rather large proportion (28%) did not.

Item	Percent Responding				
	Strongly Agree	Agree	Undecided/ Not Sure	Disagree	Strongly Disagree
I am eager to learn more about how I can use computers to teach effectively.	90%	8%	2%		
By using computer technology in my classes, I have increased my subject matter learning.	37%	35%	22%	7%	
My instructor uses computers creatively when s/he teaches.	54%	32%	10%	2%	2%
Instruction managed by computers is as effective as instruction presented by traditional instructors.	5%	46%	25%	9%	5%
My classes have not given me sufficient concrete ideas about how to integrate the use of computers into the curriculum.	3%	31%	24%	34%	9%
I have not received sufficient training on how to use computer technology.	12%	42%	9%	22%	15%
Courses that use computers to support instruction and learning should continue as a part of the university curriculum.	76%	15%	9%		
Universities that invest in computer technology for instructional purposes are using their money wisely.	75%	18%	5%	2%	
Sufficient computers are available at this university for student use to allow me to use one when I need it.	22%	29%	21%	16%	12%

Notes: N = 60; percentages may not sum to 100% because of rounding.

Table 6.4: Southern Utah University Students' Perceptions of Educational Technology Initiative Impact

ETI Impact Observed During the Evaluators' Visit. To get a better sense of how computer technology was being in integrated into SUU's instructional program, a BBIE evaluator observed a special workshop for elementary school teachers on the use of CD-ROM on March 26, 1992. Participants included 25 teachers from the Iron School District. The workshop lasted approximately two hours.

On the following day, the Technology and Teaching class was also observed. All 25 workstations were occupied by potential teachers. The same lesson material was covered by the instructor during this class as was covered in the evening workshop. The instructor used his own station for presentation purposes. The station included a computer equipped with CD-ROM, laserdisc, and a large screen projection device. Pulling images from the laserdisc, the instructor would use the capability of the computer to alter, draw or create new images. These images could be stored and used later for presentation purposes.

The instructor demonstrated these processes one step at a time. He would explain the steps, and the results of each step would appear on the large screen visible to all of the students. Seated at an individual workstation, each student repeated each teacher- demonstrated activity, step-by-step. By doing this the student learned how to use the computer, the management program, the software, and the peripheral equipment to produce slides (visuals).Students were then assigned to create their own slides while the instructor circulated among the students and assisted them.

To complete our evaluation of the impact of the new technologies, we visited two other computer labs, the central computing facilities, and several offices and classrooms. One of the two computer labs was in the library where students could work as they needed. At the time of the visit all of the workstations were occupied with students busy with their individual activities.

The second lab, located in the math building, was empty. It was being reorganized to facilitate more effective utilization.

At the central computing facility, we examined the newly installed technology that enabled classes at Cedar City High School to access information from the university library. We were also shown a couple of adjoining offices, which contained personal computers. We were told about the potential available to college instructors through the campuswide computer network.

Weber State University

ETI Impact as Perceived by Administrators. Generally, a positive attitude regarding ETI existed among the four administrators interviewed at WSU, as indicated on Table 6.5. When asked to what degree they felt that ETI had enabled instructors to develop more creative and effective lessons, two responded "moderately," one responded "substantially," and one noted that ETI had only "slight" impact in this area. Two of these administrators indicated that ETI had improved instruction "slightly," one administrator responded that ETI had a moderate impact, and one noted that there was no improvement resulting from ETI.

Three out of the four administrators responded that ETI had a "moderate" positive impact on instructor's abilities to track student progress and diagnose weaknesses, and the other administrator responded that it had a "substantial" positive impact.

Items	Percent Responding				
To what degree has ETI:	Not at All	Slightly	Moderately	Substantially	Exceptionally
Enabled instructors to develop more creative and effective lessons?		25%	50%	25%	
Improved Instruction?	25%	50%	25%		
Increased instructors' skills in tracking student progress and diagnosing weaknesses?	25%		75%		
Improved inservice teacher training in technology?		33%	33%	33%	
Encouraged collegial support among faculty?			75%	25%	
Provided time for instructors to master the basics of the technology?	25%	25%		25%	25%
Provided equal access to technology for all students and instructors?	25%			75%	
Had a demonstrable effect on teacher effectiveness?		33%	33%	33%	

Notes: N = 4; percentages may not sum to 100% because of rounding.

Table 6.5: Weber State University Administrators' Perceptions of Educational Technology Initiative Impact

Had ETI improved inservice teacher training in technology? The three responses were evenly spread from "slight" to "substantially." Three of the four administrators told us that ETI had a moderate positive impact on collegial relations among faculty, and one said it had a substantial impact. Administrators differed on whether ETI had made time available for instructors to master the basic of educational technology: two told us ETI provided an important opportunity, and two responded that ETI had a slight or negligible impact in this area.

When asked whether the ETI project provided equal access to technology for instructors and students, three administrators responded "substantially" and one disagreed, responding "not at all."

When asked to categorize the overall effect, ETI had on teachers' effectiveness, administrators' opinions varied from "slight" to "substantial."

ETI Impact as Perceived by Instructors. Fourteen instructors were surveyed regarding ETI. Their responses are displayed on Table 6.6. Instructors generally felt that the initiative was having a constructive impact on instruction.

Fifty-seven percent felt that they were using the new technologies creatively in their instruction, while 21 percent did not. By using computer technology in their classes, student subject matter learning has increased according to one-half of the instructors. At the same time, approximately one-fifth did not share this perception.

Item	Percent Responding				
	Strongly Agree	Agree	Undecided/ Not Sure	Disagree	Strongly Disagree
By using computer technology in my classes, I have increased my students' subject matter learning.	7%	43%	29%	21%	
I am able to use computers creatively in my instruction.		57%	21%	21%	
I can teach as effectively using traditional methods as I do when I use computers.		21%	36%	36%	7%
Instruction managed by computers is as effective as instruction presented by traditional instructors.		21%	50%	21%	7%
The technology enhanced courses currently being taught should continue as part of our curriculum.	31%	69%			
Students are able to use a computer whenever they have a need.		46%	31%	23%	
A quality training program on computer use has been made available to all department staff.		54%	31%	15%	
I have not received sufficient training on how to use our computer technology effectively.	23%	38%	15%	23%	

Notes: N = 14

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Table 6.6 Weber State University Faculty Perceptions of Educational Technology Initiative Impact

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A majority (43%) instructors felt they personally could teach more effectively with computers than they could without them. Twenty-one percent of the instructors believed computer-managed instruction in general was as effective as traditional instruction, while 28 percent disagreed with this position, favoring traditional instructional methods. All instructors agreed that technology-enhanced courses should continue as part of the curriculum.

A majority (54%) of the faculty felt a quality training program had been made available to them, while 15 percent did not. Faculty opinions were also divided on whether they had received sufficient training to use available computer technology effectively: 23 percent of the respondents felt they had been well-trained, but more than one-half of the 14 instructors disagreed with this position.

Almost one-half of the instructors indicated that students had use of a computer whenever there was a need; approximately one-fourth thought otherwise.

ETI Impact as Perceived by Students. We surveyed eighty-nine students of the College of Education at WSU. Their responses are displayed on Table 6.7. The majority of students (94%) were eager to learn more about using computers effectively in their teaching, and a substantial number (46%) felt they themselves learned more as a result of using computers. Forty-four percent of the students agreed that their instructors used computers creatively in their teaching; about an equal number of students had not made up their minds about this. Students were nearly evenly divided as to whether or not instruction managed by computers is as effective as instruction presented in a traditional manner by instructors.

Item	Percent Responding				
	Strongly Agree	Agree	Undecided/ Not Sure	Disagree	Strongly Disagree
I am eager to learn more about how I can use computers to teach effectively.	61%	33%	4%	2%	
By using computer technology in my classes, I have increased my subject matter learning.	8%	38%	37%	14%	3%
My instructor uses computers creatively when s/he teaches.	19%	26%	44%	9%	2%
Instruction managed by computers is as effective as instruction presented by traditional instructors.	7%	24%	35%	29%	4%
My classes have not given me sufficient concrete ideas about how to integrate the use of computers into the curriculum.	10%	49%	14%	20%	7%
I have not received sufficient training on how to use computer technology.	21%	45%	11%	15%	8%
Courses that use computers to support instruction and learning should continue as a part of the university curriculum.	36%	57%	6%		1%
Universities that invest in computer technology for instructional purposes are using their money wisely.	45%	48%	7%		
Sufficient computers are available at this university for student use to allow me to use one when I need it.	10%	44%	17%	18%	10%

Notes: N = 89; percentages may not sum to 100% because of rounding.

Table 6.7: Weber State University Students' Perceptions of Educational Technology Initiative Impact

A majority of students (59%) felt that their classes had not given them sufficient concrete ideas about how to integrate computers into the curriculum; 27 percent of the students disagreed with that position. Similarly, 66 percent of the students believed they had not received sufficient training on how to use computer technology, while 23 percent felt they had.

Nearly all students (93%) felt that computers should continue to be used to support learning in university courses and an equal proportion thought spending for computer technology was a wise instructional investment.

Although slightly more than one-half (54%) of the students were able to gain access to a computer when they needed one, 28 percent of the students found this to be a problem.

ETI Impact Observed During the Evaluators' Visit. To gain familiarity with the integration of technology into the WSU teacher preparation program, we observed two classes using mobile teaching stations on March 31, 1992.

Eighteen students, including potential teachers and school teachers from nearby Davis and Weber Districts, attended the first class. The instructor used a current musical piece played from a laserdisc as an audio aid. The lyrics were used as a springboard for a discussion of values. The presentation kept learner attention. Students viewed the use of the technology, but had no hands-on training on how to use it themselves.

During the second class, the instructor demonstrated the technologies assembled on his mobile teaching station. These consisted of a computer, CD-ROM, laserdisc player, LCD projection device, and overhead projector. As he showed the capability of each piece of hardware students observed and asked questions. In addition, the instructor introduced a camera called a "ZAP" by

taking images of students in the class and displaying them on a computer monitor. (A ZAP camera takes still images which are immediately changed to a digital signal that can be input to a computer and shown on a monitor.) Students seemed delighted to see themselves on screen and were enamored of the technology. When images were displayed during the presentation, students complained about the inadequate brightness of the large screen projection unit. A large class, being held in a large room, made it necessary for some students to sit too far from the screen or at a bad angle, thus impeding good viewing. Following the lesson presentation and assignment, students were sent to a computer lab to practice skills and to complete assignments.

The instructors' demonstrations of use of the equipment in the classroom was clear and his teaching techniques established him as a good instructional role model. Apparently, follow-up practice is the responsibility of the students who have the equipment available through the labs. We were unable to determine from this visit if students must document their practice, or demonstrate the skills they are expected to acquire.

Additional visits were made to two computer labs, several offices, and the Technology Enhanced Classroom (TEC) to examine the technology and observe the activities. These visits were made later in the day following the conclusion of most classes. The computer labs were about one-third full of students, one instructor was in her office using the ETI-provided PC's, and no one was in the TEC. Students who were in the computer lab occupied PC workstations, worked individually on varied activities, and used mostly word processing software. No students were observed using the technologies demonstrated earlier in the beginning class on technology. WSU has numerous computer labs besides those in the education building, however, and Teacher Education students may have been elsewhere working on assignments.

Comparing Students' Perceptions

As noted earlier, we surveyed students about their perceptions of the role of computer technology in supporting instruction, and the training they had received. The results of these surveys have been displayed on Tables 6.4 and 6.7 and discussed separately earlier in this chapter. Because there appeared to be a substantial difference in the response of students at the two universities, we decided to use statistical methods to compare their overall perceptions. To this end, we created two scales based on the items on the university student survey.[1] The first scale included items focusing on the efficacy of computer-supported instruction.[2] The second scale was based on three items relating to the effectiveness of the training students had received and the difficulty they experienced using computers.[3] *T*-test were then used to compare SUU and WSU students' scores on the two scales. The results of these comparisons appear on Table 6.8.

Students at Southern Utah University had significantly more positive attitudes toward using computers in their instruction and toward the training they had received than students at Weber State University. Although it is impossible to say with certainty what was responsible for these differences, several factors may be involved. First, SUU only recently installed computer laboratories, and the newness of the technology may have contributed to a general halo effect and encouraged students' positive attitudes toward computers. Other research (Clark and Solomon, 1986) has documented that a new technology system is likely to create higher levels of enthusiasm than more of the same technology added to an existing system.

Second, the administration of SUU had selected and hired a new staff member who was experienced in using technology for teacher education and appointed that person as coordinator for the project. This gave the department a person

Scale Score	N	Mean	SD	*t*
Attitude Toward Computers				
SUU Students	54	3.29	.55	-5.21*
WSU Students	78	2.81	.56	
Training Effectiveness				
SUU Students	54	2.31	.87	-2.56**
WSU Students	78	1.93	.91	

Notes: Scale runs from 1 to 5 with 5 being the most positive score.

* = $p < .001$; ** = $p < .05$.

Table 6.8: Students at Southern Utah University and Weber State University Attitudes Toward Computers and Training Effectiveness

who reported directly to the dean, and whose major responsibility was to direct and support the goals and objectives of ETI, while functioning as a classroom instructor and providing the inservice activities for teachers and administrators in the field. In contrast, the ETI Coordinator at WSU had this new assignment along with multiple responsibilities he held previously with the department. This difference in responsibilities may have affected the time and effort available for ETI goals and objectives.

Finally, at SUU there was considerable more hands-on use of the technology during classroom instruction than at WSU. The students at SUU used the lab for practice and had aides available in the lab to assist them as needed. WSU students did have more accessibility to labs than SUU students, but it is unclear if the students used the labs to replicate classroom demonstrations or more for word processing and assignments from other courses.

Conclusions

- **ETI is perceived by administrators and faculty to have a positive impact in the College of Education at SUU and WSU.** SUU administrators were quite confident that ETI had had a substantial impact in the areas of instructional improvement, student learning, faculty collegiality, and improved inservice training. WSU administrators were more moderate in their assessment of ETI's influence. The majority of instructors at both schools agreed that they were able to use technology creatively in their instruction.

- **Although training has been made available to instructors, more training and support is needed.** At least one-half of the professors surveyed at both SUU and WSU felt they had not received sufficient training on how to use computer technology effectively.

- **Whether or not students have adequate access to a computer needs to be examined further.** Twenty-eight percent of the students at both SUU and WSU perceived they did not have sufficient access to a computer. At the same time, visits to computer labs revealed available workstations, and nearly empty labs during the late afternoons.

- **A substantial proportion of students feel they need more training in the integration of computer technology in their instruction.** At SUU, 34 percent of the students felt that their training in the application of technology into the curriculum was insufficient; another 24 percent was undecided about this issue. At WSU, 59 percent wanted more training, with 14 percent undecided.

- **Some ETI funds have been expended to purchase computers and peripheral devices for faculty members.** The direct relationship between such purchases and the goal of improving the use of technology by K-12 teachers merits further exploration. While it is sensible that university professors must use and understand computer technology before they can encourage others to use the same technology, it is unclear from our observations whether such encouragement occurred from teacher education faculty not specifically charged with technology education.

Endnotes

1 We used the following process to form the scales. First, negatively-worded items were recoded to reflect a consistent positive orientation. Then, a principal components factor analysis was conducted on the 19 items appearing on the "University Students' Attitude Toward ETI" questionnaire. We inspected the Eigen values of the resulting correlation matrix, and determined there was one main factor with an Eigen value = 7.32. The Eigen value of remaining factors varied from 1.52 to 0.19. We then conducted a second principal components factor analysis with varimax rotation and forced a two-factor solution. The first factor accounted for 82.8% of the variance. We inspected the rotated factor loadings for each questionnaire item, and established an arbitrary cut-off of 0.550. This enabled us to form two scales: Attitude Toward Computers and Training Effectiveness.

2 The first scale, Attitude Toward Computers, contained the following 11 items.

Item #	Content
1.	Computers have the potential to greatly improve education.
2.	I am eager to learn more about how I can use computers to teach effectively.
4.	Universities that invest in computer technology for instructional purposes are using their money wisely.
5.	My instructor uses computers creatively when s/he teaches.
6.	Computers can be very effective in supporting mathematics instruction.
8.	I do not learn as effectively through computer-assisted instruction as I do in the traditional way.
9.	Using computers increases my motivation to learn.
11.	I can learn material in less time using computers.
12.	Using computers is a stimulating intellectual experience for me.
14.	By using computer technology in my classes, I have increased my subject matter learning.
15.	Courses that use computers to support instruction and learning should continue as a part of the university curriculum

For this scale, Cronbach's *alpha* = 0.90. Interitem correlations range from 0.23 to 0.67 with a mean correlation of 0.47. Individual student scores were created by calculating the mean response on the 11 items.

3 The second scale, Training Effectiveness, contained the following three items.

Item #	Content
3.	It is not difficult to use computers.
16.	I have not received sufficient training on how to use computer technology effectively.
17.	My classes have not given me sufficient concrete ideas about how to integrate the use of computers into the curriculum.

For this scale, Cronbach's *alpha* = 0.71. Interitem correlations range from 0.35 to 0.55 with a mean correlation of 0.45. Once again, individual student scores were created by calculating the mean response on the three items.

Chapter 7

Case Study: North Summit School District

Case Study:
North Summit School District

Introduction

North Summit is a small rural school district located in Summit County, approximately 30 miles northeast of Salt Lake City. The district has a total student enrollment of 906. Students attend North Summit Elementary School (351 students), North Summit Middle School (325 students), and North Summit High School (230 students). All three schools are located in the small town of Coalville within a mile each other. The district office is located in the middle school. Student achievement, as measured by SAT scores, is above the national average.

Before the Educational Technology Initiative, the district wrote grants to obtain funding to equip a small computer lab in each school. The North Summit Elementary School computer lab consisted of 9 Apple IIe's and Franklin Ace 1000's. The North Summit Middle School had 14 Apple IIe's and 2 Apple II's in its computer lab. The North Summit High School had 14 Apple IIe's and IIc's.

The district was a member of the Minnesota Educational Computing Consortium (MECC) and used the MECC drill and practice software in elementary language arts and mathematics. In the middle school, teachers and students used WANDA writing software. The high school used computer-aided design and drafting programs, as well as word processing and spreadsheet software. The district had also installed a computerized bookkeeping system. Before the Educational Technology Initiative, the district had a strong

commitment to technology but did not have much money available to purchase computers and software. According to district officials, ETI allowed them to develop a substantial technology program within the schools.

Method

A researcher from the Beryl Buck Institute for Education visited North Summit School District for one day and interviewed district administrators and teachers about the development and implementation of the district's Educational Technology Initiative plan. He interviewed the North Summit Superintendent and reviewed the district's ETI plan. The researcher then visited the North Summit Elementary School and interviewed the computer lab coordinator. He also visited several classrooms, talked with teachers and students, and collected examples of student work.

At North Summit Middle School, the researcher interviewed the principal, a language arts teacher and a science teacher. In addition, he observed students using the language arts computer lab, and attended a science presentation using laser disc technology. Finally, the researcher met with teachers and students at North Summit High School in the vocational technology lab, business computer lab and math computer lab. All interviews were tape recorded and transcribed. The report below is based on these interview transcripts, the written ETI plan prepared by the district, and on observations conducted in the schools.

The Development of the ETI Plan

North Summit School District formed a technology committee to develop an Educational Technology Initiative plan as soon as the ETI legislation was

approved. The committee is chaired by the Superintendent, who also serves as the ETI Coordinator. Members include principals from the elementary, middle and high schools, teacher representatives from each school (two elementary, one middle, and one high school teacher), as well as the district media specialist. The Superintendent selected specific teachers to participate on the committee because of their technological expertise and interest. Two members of the committee have previously served as district technology experts, and the middle school teacher had taught the WANDA computer writing program. As the Superintendent noted:

> It was just a natural process that the principals and these people who are interested are involved in the whole process.

The ETI Committee worked on the district's ETI proposal for four months. They started by doing a needs assessment to identify the hardware and software currently being used in each school. They then consulted with several experts: a technical expert from a local vendor, Alpine Computing, and a consultant from the Northern Utah Service Center, who offered advice on hardware and software. They received ongoing assistance from a member of the state ETI office who helped the committee develop and revise their plan.

During this development process, North Summit's plan was submitted to the ETI office on four occasions and revised according to the feedback they received. Following these revisions, the Superintendent authored a then final plan, which was then approved by the North Summit School Board. The plan was approved by the state ETI Steering Committee in September 1990. North Summit's ETI Committee continues on an "as needed" basis. In January 1991, the committee organized a meeting and demonstration for the local community to make them aware of the technological resources available in the schools.

The ETI Plan

The ETI committee identified five main goals for the district's ETI plan.

1. Improve reading comprehension, phonetic skills, critical reading skills and related written composition in grades K-8. Provide access for all students to a writing lab. Develop a computerized system to track student progress.

2. Increase mathematical computation skills and application of mathematical concepts at all grade levels.

3. Integrate technology across the curriculum through labs and classroom-based computer workstations.

4. Provide staff development and support to teachers in integrating technology into curriculum, instruction, assessment and classroom management.

5. Improve the achievement of students identified as Chapter I, At Risk, disadvantaged, or potential drop-outs.

Allocation of resources was negotiated within the ETI committee which contained principals and teachers from the elementary, intermediate and high schools. Each school argued for their individual needs.

> We met in here [the district office] and argued back and forth. What do you need up there [in the elementary school]? What do we need here in the middle school? What do we need in the

> high school? So there was tremendous discussion and debate as to exactly what the needs were. (Superintendent)

In the first year the ETI Committee's main priority was to install a complete lab in each school which was not dependent on further ETI funding. They reasoned that if funding continued it could be used to develop a more elaborate system. As the Superintendent noted:

> The goal was to get the system running as early as possible and then build onto it from there rather than making one year dependant on the next.

In the second year the district purchased the Alexandria Library System to computerize the card catalogues in the school libraries, the trACE instructional management system which helps teachers track grades and attendance, laserdisc players and discs, CD ROM players and discs and new software.

School Implementation

North Summit Elementary School

With the plan as a guideline, North Summit teachers and administrators set about to meet the technological needs they had identified.

In 1990-91, the North Summit Elementary School was awarded $38,883 of the ETI money to install 25 Apple IIg's computers in a self-contained lab. Finding approximate space was a problem, and two rooms were combined to create a workable space for the lab. The Apple computers were networked and connected to two Imagewriter dot matrix printers. Students in grades K through 6 are scheduled to use the lab, which is staffed by a computer

specialist who teaches all the computer-assisted classes. Students are working to build keyboarding skills and develop their language arts and mathematics knowledge using the MECC software that was already available at the school. The Apple IIe's that were previously in the computer lab were distributed to individual teachers for classroom use.

In 1991-92, North Summit Elementary School was allocated $23,560 from the district's ETI grant. This money was used to install 14 networked Mac Classics in classrooms for use with the trACE system. The school also purchased a laser printer, scanner, laserdisc player and monitor, two LCD projection plates and additional software, monitors and technical equipment. The teachers are now using the trRACE system for grades and attendance record-keeping as well as for ordering supplies. Teachers can also use the trACE system to generate customized worksheets. For example, one teacher said:

> If you have five words kids are having trouble with, you type in the words and it will generate a worksheet with those words that leaves out certain letters. These aren't work sheets coming out of a book; these are teacher designed. You can do a math sheet. I love this one, because I know as a teacher you may need some extra practice but the book is out . . . . With this one you can decide if you want to carry or borrow. It prints it out and you have a worksheet. This is precision math teaching.

Students in the computer lab now have a wider variety of software to use. While continuing to build their keyboarding skills, they have also begun to use Appleworks to complete language arts assignments and LOGO to write computer programs and create graphics.

North Summit Middle School

In 1991 a new middle school was built and a computer lab was incorporated in the design. During 1990-1991, the school was allocated $27,289 of ETI funds. This money was used to purchase 30 Mac +'s, a laser printer and CD ROM player and installed this hardware in the lab. This lab is primarily used for writing and keyboarding. The teachers have established a developmental sequence of expected computer skills. As one teacher noted:

> We know our curriculum is going to have to change as the kids come to us with different skills. So what we are doing right now is we teach the keyboarding skill in the fifth and sixth grades to give them a good foundation. At seventh grade we go into the word processing and eighth graders go beyond that and do some data base and spread sheet.

For the 1991-92 school year, North Summit Middle School received $31,430 of ETI funds. The 16 old Apple IIe's were placed in individual classrooms for teacher use. Using the ETI money, the school purchased 11 Mac Classics and installed them in individual classrooms. This enabled the teachers to take advantage of the trACE system for record-keeping. In addition, ETI money was used to upgrade Mac +'s in the computer lab by installing hard drives in each machine. ETI money was also used to acquire a laserdisc player and monitor, two LCD projection plates and two scanners. The laserdisc players are used primarily for video disc presentations in the science classes. According to the science teacher:

> Basically it is a disc enclosed with a kit and depending on what you want -- whether it is life science, earth science, physical science -- they've set up a kit for you. The best way to describe it would be a script. It's like an electronic book. You have a script in a series of lessons and part of it you read or you teach

> in your own words based on the specific pictures you are showing and other parts will be a narrative where I don't say anything. I'll punch play and then it will give you a short clip of film.

North Summit High School

In 1990-91, North Summit High School received $44,853 of ETI funds. This money was used to purchase 30 Mac SE20's, a fileserver, a laser printer and a CD ROM player. All of this hardware was installed in the existing computer lab. The new equipment allows students to do word processing, create graphics, manipulate data on spread sheets, and data bases and use the scanner to input graphics. Students are able to produce documents that include text, graphics, photographs, tables, and use desktop publishing techniques to produce school newsletters and brochures. One teacher noted:

> I've made [students] write their life history, and they had to have at least five pages. [One student] scanned in a picture of his dog and his horses and more dogs and his snowmobile.

For the 1991-92 school year, the school was allocated $19,366. This money was used to purchase 11 Mac Classics, a laserdisc player and monitor, 3 scanners and 2 LCD plates. The Macintosh computers were placed in individual teacher's classrooms so they could use the trACE system to track student progress. One teacher commented:

> It is a time saving thing. A kid can come and look at their grade any time. They've been given a number and they can look (on the posted computer print out) to see exactly where they're at. I publish that every time I add a new assignment. They can come and check and see exactly what they are missing and where they stand.

Although currently unused, the 14 Apple II computers that existed at North Summit High School before ETI will be used to set up math and science mini-labs. The school also has fully functional business and vocational technology labs that were installed before the Educational Technology Initiative. In addition, the school had a program using graphing calculators in place before the ETI. The math teachers believe these calculators help students work through the curriculum faster and develop deeper understandings:

> This year we've gone over a third more material because of the time we used to spend trying to plot these things. The time is saved plus their understanding is better. As a result of it even in my trigonometry class right now we are far enough along that in about two weeks we are going to start into calculus which we are really not supposed to get to until next fall.

Special Education

Children with learning disabilities and low achievers receive additional tutoring in the computer lab on Friday (which is not a school day since North Summit School District operates on a four-day week). In the self-contained special education classroom, ETI funds have also been used to provide each teacher with a Mac Classic.

Adult Education

School facilities are used to teach computer education classes after school for parents and other adults in the community.

Staff Development

The district has provided several opportunities for teachers to receive training in the use of computers:

> We provided three workshop opportunities to learn how to operate the computers, and then we've had a trACE workshop to upgrade that. At the present time, the school district is offering computer classes which many of the people are taking, and we also have a lot of people taking classes from [State Technology Specialist] Jolene Morris." (Superintendent)

Training is done after school hours so that no instructional time is taken up by the computer workshops. Initial training was provided by the vendors and additional training was arranged by having two district people go through a trACE workshop and train the remaining staff. Before installing Mac Classic computers in individual classrooms, teachers were required to complete a trACE training program.

Constraints

Two constraints emerged in the development of the district's ETI program: (1) limited fiscal and personnel resources and (2) space. North Summit is a small district with approximately 53 full time teachers and administrators. Financial resources are limited, and it was difficult to create a detailed ETI Plan. As the Superintendent noted:

> [Our plan] is not an elaborate drawn out program like they have in some of the large districts. We do not have the personnel to put in that kind of man hours.

To save money they did their own equipment installation and cabling:

> Our maintenance people are the ones that pulled the lines on almost all of this. We've done it in-house, just to cut costs.

The high school technology teacher was assigned to trouble shoot technical problems at the school site and help with programming.

> If they run into a difficult problem then he goes out and helps them out if he can. If not, then he will bring in someone from the outside." (Superintendent)

The district has tried to raise funds in the local community but they have had little success.

Space was also a problem. Two rooms had to be combined to create a lab in the elementary school and it was difficult to find space in the high schools. Specific space for the middle school computer lab was designated when planning the new building.

Evaluation

North Summit School District has taken three steps to evaluate the effectiveness of their ETI project:

1. They are monitoring students' standardized test scores.

2. A faculty member from Utah State University has been involved in a program evaluation of the North Summit project which provided a report containing strengths and weaknesses of the program as well as recommendations for the coming years.

3. Jolene Morris, an educational technology specialist from the State Office of Education is preparing an independent evaluation of the project.

Chapter 8

Case Study: Morgan County School District

Case Study:
Morgan County School District

Introduction

Morgan School District is located in a rural farming community approximately 30 miles northwest of Salt Lake City. Situated at an elevation of over 5,000 feet, the district enrolls a total of 1,794 students. There is one elementary school containing 696 students, one middle school with 597 students, and a single high school enrolling 501 students. The three schools and the district administrative offices are all located within 300 yards of each other in the small town of Morgan.

The district staff have been utilizing educational technology for several years. Before the Educational Technology Initiative, Morgan High School computer labs used to teach keyboarding, word processing and business applications. These labs contained MS-DOS computers. In the winter of 1989 a MAC lab was added and used to teach writing. Before ETI, Morgan Middle School had a single computer lab equipped with Apple IIe machines. This lab was used for teaching the state TLC vocational education program, which includes helping students to learn word processing skills and data manipulation using spread sheets. The elementary school had an Apple GS lab which was used for tutoring individual students.

In 1989 the district administration decided they wanted to more effectively utilize and develop the technology program. They hired a technology specialist, a fifth grade teacher from outside the district, to work in both the

technology and adult education programs. This individual was charged with creating the district technology plan that was implemented with ETI funds.

Method

A researcher from Beryl Buck Institute for Education visited the Morgan School District for several days over the course of a three-month period. During these visits, she interviewed administrators and teachers, and met with the district Superintendent and ETI Coordinator. She also reviewed Morgan's ETI Plan and visited the elementary, middle and high school computer labs, where she observed students working. At the same time, she conducted interviews with the supervising teachers. All the interviews were tape recorded and transcribed. The description of the Morgan School District ETI project presented below is based on her observations, interviews, and information contained in the ETI Plan.

The Development of the ETI Plan

In March of 1990, an ETI Committee was formed to develop a technology plan for Morgan County School District. The committee was chaired by the technology specialist, who became the ETI Coordinator. Members included one elementary, one middle school, one high school teacher, as well as the principal of Morgan High School. These committee members were selected because they had an interest in technology and some expertise in the educational applications of computers. The committee met on a monthly basis to discuss how technology could best be infused into Morgan's schools and gather information about available products and approaches.

In May of 1990, the committee attended Utah Educational Technology Initiative Conference and a regional planning meeting at Weber State University. Several commercial vendors including Apple, IBM and Jostens, visited the district and made presentations about their hardware and software. All the teachers in the district viewed a presentation using video disks that demonstrated how video disks and computers could be used together. The ETI Committee also looked at the ETI plans prepared by other school districts, which included Box Elder, Davis, Granite, Jordan and Heber City. Another influence on the development of the ETI plan was Morgan School District' s involvement in the Outcome Driven Developmental Model (ODDM). This model focuses on bringing teachers and administrators together in a process of cooperative goal setting, instructional planning and decision making. Morgan School District has an ODDM core team consisting of the Superintendent, all three principals, and ten teachers. This core team gave input in the development of the ETI plan.

Dr. Smellie, a professor of instructional technology at Utah State University, met with the committee to discuss the utilization of computers in instruction. He presented a variety of approaches but focused on what he termed the "intelligent use of technology" -- i.e., the use of technology as a tool for student learning rather than as a tutor for drill and practice. This stimulated the ETI Committee to envision and commit themselves to utilizing computers in new ways in Morgan's schools.

According to the ETI Coordinator, the ETI Committee concluded that the computer and the related microchip technologies were simply tools that take the place of a pencil. It is possible, even probable, that as new technology is brought into the schools it will be used in the same way as were previous tools, much as a typewriter is used like a more efficient pencil. But such usage

ignores the capability and potential of the computer, a machine much more powerful and flexible than the typewriter.

> Intelligent use would be using those machines to their fullest potential and that means thinking about machines in non-traditional ways. So that it's not just superimposed on a routine and a tradition that has been developed over the last 200 years. That is where we are in our district now--looking at how we can do that. We can superimpose it on the existing structure, and we've done that--but we have to go beyond that and that is the intelligent use. (ETI Coordinator)

The ETI Committee believed that to facilitate the use of the computer in intelligent and innovative ways they needed to select a computer system that was easy to use by those unfamiliar with computers:

> We felt that one of the main reasons that computer technology and the microchip technology in general had not been incorporated as a general teaching tool by all teachers, was the fact that its human-machine interface was not a very good one. (ETI Coordinator)

They decided that the Macintosh technology was the most user friendly. According to the ETI Coordinator: "It was something the average classroom teacher could practically grasp." The ETI Committee had a series of meetings with Apple Corporation in Salt Lake City to discuss hardware options and select a system.

Throughout the entire process of developing the ETI plan, the committee worked closely with the state ETI Director, Curt Fawson, and his staff. Curt visited the Morgan School District, looked at the existing facilities and discussed the Morgan District ETI Committee's evolving ideas. Finally, the ETI plan was presented and discussed at a districtwide faculty meeting. In general,

faculty supported the ideas it espoused, and the plan was presented to and approved by the Morgan County Board of Education.

The ETI Plan

The guiding principles of the Morgan County School District ETI plan emphasize the importance of:

- Making technology part of daily school life
- Giving teachers extensive inservice training
- Utilizing technology in intelligent ways:

1. Technology should become part of the daily lives of students and teachers in the same way as it pervades our homes, workplaces and entire society.

2. Teachers will need extensive inservice training if they are to successfully utilize technology in instruction. They will need a substantial amount of time and support. They will require training in computer operation and training in the integration of computers in classroom instruction. Because technology is evolving rapidly inservice training will need to be ongoing.

   Effective implementation will require that computers become fully integrated into the personal and professional lives of teachers.

3. Technology should be used as an interactive not passive medium. This requires the provision of high quality software and technology support materials -- Hypercard stacks, video disk lessons, CD ROM strategies, etc. It should also be used in a variety of ways -- for tutorial programs, production and organization of materials and data, information seeking through electronic data bases and communication.

To make computers part of teachers' and administrators' daily lives and ensure adequate inservice training the ETI program contained, "A Lifestyle Change" staff development program. This plan allowed teachers completing a comprehensive program of training to receive a personal Macintosh computer to use at home or school. The program was partly funded by ETI, partly by a $50,000 Utah State Office of Education Productivity Grant, and partly from private donations. (Campbell Scientific and Apple Corporation donated one-third of the computers.) To earn a computer, teachers were required to take the following courses: Introduction to the Macintosh, MAC School Marks, Microsoft Works/Word, SuperPaint, Hypercard-video Disk and LXR Text. They were also required to develop a portfolio which included computer generated classroom materials such as grade sheets, worksheets, Hypercard stacks, video disk lessons and word processing documents. The ETI Committee believed that teachers not only needed to know how to operate a computer but they also needed to thoroughly understand how to use a range of software.

> One of our beliefs here is that in order to make technology meaningful you've got to teach (teachers) the software you are going to use. Some people approach the computer, "Oh I'm going to learn the computer," and they have no end purpose in mind. You've got to have an end purpose in mind. You've got to focus in on instruction. (ETI Coordinator)

To date, every teacher and administrator in the district has earned a computer through the staff development program. The plan has been so successful that the Teachers' Association has negotiated with the school board so that new teachers entering the district can join the program. An independent evaluation of the "Lifestyle Change" Project conducted by Dr. Nick Eastmond and Ms. Inhae Kim concludes:[1]

> The "Lifestyles" Project of the Morgan School District has succeeded in enlisting the active involvement of 84 of 86 potential participants. From the results of a written questionnaire, a series of interviews, on-site observations, and an examination of individual assignments completed, the Project receives high marks for both involvement and attitude change. Along a number of dimensions ... this has the earmarks of being a superior project.
>
> In measures comparing the project with a group of educators from the Provo School District, the participants in the "Lifestyle Change" Project showed attitudes quite comparable to people who had self-selected their inservice and generally worked with computers for a longer period of time. The Morgan group begin with a more diversified range of teachers in terms of age, time in teaching, and prior experience with computers. By the end of the project, the two groups were remarkably similar with certain comparisons favoring one group and certain favoring another. That this project could take the diverse group of Morgan educators and have their attitudes become so similar to the comparison group is an accomplishment worth nothing.

In addition to ensuring that Morgan teachers were able to use computers in their instruction, the ETI Committee wanted to establish computer-assisted education as part of a student's daily program. The committee developed the following computer literacy objectives for students in grades K-8 to begin to integrate computer use into the curriculum. The aim of these objectives is to

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[1] Eastmond N. & J. Kim, An Evaluation of the Project "A Lifestyle Change" Final Report, April 9, 1992 (Copies of the report may be obtained from the authors at 815 Canyon Road, Logan, UT 84321.

cumulatively develop students' computer skills so that by the intermediate and high school levels students can use computer tools across the curriculum.

- Kindergarten students will be able to operate a computer.
- First grade students will understand basic computer terminology, utilize special function keys, use the LOGO program to create shapes and use LOGO primitives SHOWTURTLE, FORWARD, BACK, RIGHT TURN, LEFT TURN, CLEARSCREEN and HOME.
- Second grade students will understand the difference between hardware and software, be able to boot up and run a program from memory, and use LOGO primitives--HIDETURTLE, PENUP AND PENDOWN.
- Third grade students will be able to define and spell computer terms CATALOG, RUN, MENU and BOOT. Demonstrate the ability to stop, escape from and continue a program. Begin to touch type. Demonstrate the use of LOGO commands SETC (set pen color) and SETBG (set background) and reproduce geometric shapes using LOGO.
- Fourth grade students will be able to define the terms hardware, software, MEMORY, K, RAM, ROM, and CPU. Use number keys and finger keys with correct fingering. Use word processing software and printer and save text files. Write specific steps in the solution of a problem using LOGO.
- Fifth grade students will be able to touch type on keyboard, use word processing to prepare and edit reports. Compose stories, reports, poetry etc. on the computer. Define an algorithm using LOGO. Write and edit LOGO procedures.
- Sixth grade students will be able to identify the location of five internal components of a computer: Keyboard, monitor, CPU, RAM and ROM. Increase proficiency in word processing. Edit text. Use the computer in science English and health classes.
- Seventh grade students will be able to identify the components of the computer and demonstrate their operations. Use computer as a word processor, using all editing procedures. Develop and run a short program using BASIC language. Create a data base and print reports from it. Create and print a

spreadsheet file. Use computer graphics to display programs visually. Use LOGO to write, edit and save programming procedures.

- Eight grade students will perfect their skills in using the computer to produce letters, reports, graphics, tables etc. They will understand the value of computers as learning tools and incorporate them into their school life.

To facilitate the use of computers in "intelligent" ways, the district focused on integrating the use of tool-based software and involving teachers and students in the process. In the first year staff development focused on the use of laserdisc technology and Hypercard:

> We took ten teachers and zeroed in on them with staff development. It was like 15 hours of training on how to use the video disk as a stand-alone machine and attached to a computer and Hypercard. So they actually built Hypercard stacks that run the video disk player. (ETI Coordinator)

In the second year, the district staff developed a "hyper-learning" project which focused on more extensive application of Hypercard. George Lugenbil, a consultant from Apple Corporation, trained ten teams of one teacher and three students: four elementary, four intermediate and four high school teams. The training sessions highlighted group learning processes and gave participants the opportunity to become familiar with Hypercard and authoring software. These teams then returned to their schools to train other teams of students and teachers. This training process has now been taken over by two middle school teachers who are working with other teachers in the district. Discussions are also under way to involve high school teachers in the project.

According to the Morgan Superintendent:

> A couple of teachers came to me and said, "Hey, we can conduct this kind of inservice week and do it better than the Apple guy did" and I said, "All right, you probably can."

So they formed a group and they conducted that inservice right here in the middle school. Now they've got fifteen teachers signed up over at the middle school that want to do the same thing.

School Implementation

Morgan Elementary School

In addition to using ETI funds to implement staff development programs and establish curricular objectives for computer literacy, Morgan School District has installed new computer hardware in all of its schools.

Before ETI, Morgan school had a computer lab equipped with Apple II GS computers. These computers were used for individual tutoring.

Using ETI funds, the district installed a second 30 station lab equipped with Apple II GS computers. Both labs are used with CNS Corporation Integrated Learning System (ILS) software for reading and mathematics instruction. The ETI Coordinator and teachers report that they found the ILS software somewhat restrictive, and would like to use the computers for more innovative applications.

> We're disappointed in the results. I think that most students can go beyond that. Maybe if we targeted it right at students who could really benefit from it -- which I would say is the lower

> third -- but I think most students can learn faster under another system than they can [using an] integrated learning [system]. (Elementary school teacher)

ETI funds were also used to purchase keyboarding machines used predominantly by third graders. The district also gathered up about 30 old Franklin machines and are upgrading them. These computers will be installed in a third lab which will be used for tool-based software such as Hyperscreen and Hypercard. The school received 4 LCD plates which teachers use for instructional presentations.

Morgan Middle School

Before ETI, Morgan Middle School had a computer lab equipped with Apple IIe computers. These were used for teaching Utah's TLC vocational education program. As part of this curriculum, students learn to use computers for word processing and to manipulate numbers on spread sheets.

With ETI funds, the district placed a Macintosh work station in every teacher's classroom networked through a file server. Teachers typically use these computers as a personal productivity tool -- i.e., for recording grades, preparing handouts and assignments, etc. For example, one middle school teacher uses the computer to generate student progress reports:

> I send parents a weekly progress report on what a student's grades are at that point and any missing assignments....and I've got notes back [from parents saying] that it is really nice that they know where the student stands at the end of each week and they don't have to wait for midterms or a final grade. It makes communication between us more open because that goes home every week and they can write notes on it if they have any questions because they do return that portion.

The school also purchased 4 LCD projection plates with ETI funds. Teachers use those for instructional presentations. In addition, the school purchased 18 Macintosh computers and clustered them in three classrooms. Ten Macintosh workstations were placed in a fifth grade classroom and four Macintosh machines were placed in one fifth and one sixth grade classroom. Teachers rotate through the classrooms to use the computers as part of a conceptual mathematics curriculum project. These fifth and sixth grade teachers are also involved in the collaborative staff development project with two mathematics educators from the University of Utah who are working in the classrooms to integrate the use of Hypercard software into the mathematics curriculum.

Morgan High School

Before ETI, the high school had two computer labs equipped with MS DOS computers. These were used to teach keyboarding, word processing and business applications. These labs were operating at capacity: classes are scheduled during every period of every school day. Another computer lab equipped with Macintosh computers is used for writing instruction. When not needed for whole class instruction, the lab is made available for student use. Students can schedule themselves individually.

> . . . anybody and everybody can go in there, you just schedule it. You walk in there and there will be 20 students plunking away, trying to get something done. (High school teacher)

With ETI money, the district also installed a central fileserver networked to a computer station in every teachers classroom. The media center will soon be linked to the network with an electronic card catalogue and a video disk player. With a combination of ETI and vocational education funding, a career guidance GIS lab was also installed in the high school. This is hooked into the mainframe computer at the State Office of Education so that students and

teachers can obtain information about programs in higher education and vocational and professional training programs. To utilize this resource, students work in groups under the supervision of an aide.

Adult Education

The district used adult education funding, in conjunction with ETI money, to develop a computer-assisted tutoring program for adults. This program is located in the district office. Two terminals are connected to the central office IBM 80 system, which has courseware installed that enables adults to take a series of courses which give them credit towards high school graduation.

Constraints

According to the ETI Coordinator, the major constraint faced by the district in implementing the ETI was getting students, teachers and parents to change the way they viewed teaching and learning -- "to start to view schools in a whole new way." From the beginning, the administrators and faculty in Morgan County School District had wanted to utilize technology in the most innovative, "intelligent" ways. The challenge was to get:

> . . . teachers involved in doing things they've never done before ETI . . . [to] change tradition . . . How do you change tradition? How do you gain a new way of looking at things?

> We are in the throes of that -- in fact, I think it has us by the neck. You can't do it quickly. I think you've actually got to go right into the classroom and do it right there, because the teacher gets burdened down with tradition. They've got to cover the curriculum and they've got to do it in this amount of time . . . We haven't gotten around it, but what we've tried to do is say to the teacher you can do this in a different way. We are

> not asking you to do more, we are just asking you to do it different. Which isn't entirely true, because when you are making a transition like that, I think you are going to do more. When you are learning, when you are shifting you are just going to have to cover two bases at one time. (ETI Coordinator)

A middle school teacher agreed with the ETI Coordinator:

> I'm glad the State has invested in this because I think it is where we need to go. But it has been frustrating for me because I see so much that I could do, but timewise it limits me because there is only 24 hours in a day. Also being tied to the state core curriculum and making sure we get that material and right now coming up with software that will meet those needs. The transition has also been difficult for students.

> Well, sometimes it frustrates the heck out of them because they are so used to some of the old kind of ways and it sometimes seems easier. They are learning how to use the computer. They are learning how it can help them and make their life easier. It is also making them think and sometimes it makes them angry because some inanimate object is making them do more than they did on their own. So they are doing a lot more because something is pushing them other than me.

The administration and staff of Morgan School District have responded to this constraint by involving students and teachers in the classroom-based staff development activities described above which focus on integrating computers into classroom instruction.

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Appendix A

Utah Educational Technology
Initiative (ETI) Evaluation

Teacher Questionnaires - Grades K-12

SOE 03-26-2623-15

Utah Educational Technology Initiative (ETI) Evaluation

Teacher Questionnaire *Grades K-2*

The purpose of this questionnaire is to gather the perceptions of teachers involved in ETI about project functioning and technology use at their schools. We know that many projects are just beginning, and may not have accomplished as much as they will in the future. **Please use this questionnaire to establish a baseline against which future project activities and accomplishments can be measured.** We will ask for your perceptions of project functioning again next year.

1. School name _____(11) District _____(12) State Directory School Number _____ - _____(1)

2. School address _____(13) Phone # _____(14)

3. How many years have you been a teacher? _____(2) What grade level do you teach?_____(3)

4. How many years have you taught the grade level or subject(s) you are teaching now? _____(4)

5. Circle which of the following best describes your school:(5)

   Elementary[1] Other (describe) _____[7]

6. About how many hours per week have you typically used technology for ***instructional purposes*** in each of the following years:

_____(7)	_____(8)	_____(9)
1989-1990	1990-1991	1991-1992
(Before ETI)	(last year)	(this year)

7. Do you *regularly* use computer technology for:

   Writing Instruction?(10) NO[1] YES[2] (circle one) Math Instruction?(12) NO[1] YES[2] (circle one)

   Reading Instruction?(11) NO[1] YES[2] (circle one) Other Instruction?(13) NO[1] YES[2] (circle one)

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Please use this scale to answer question 8. Write your answers on the line to the left of each answer.

1	2	3	4	5
Not Effective	**Somewhat Effective**	**Effective**	**Strongly Effective**	**Extremely Effective**

8. How effective do you believe computers can be in supporting the teaching of the following subjects:

____(14) Writing. Why? (If possible, give an example)(15)

What software programs are you using to support writing instruction?(16)

____(15) Reading. Why? (If possible, give an example)(17)

What software programs are you using to support reading instruction?(18)

____(16) Mathematics. Why? (If possible, give an example)(19)

What software programs are you using to support mathematics instruction?(1 10)

9. How many hours of inservice training associated with ETI in each of the following subjects have you attended since September 1990? (If you have not attended any inservice training, circle NA, and skip to question 13.) NA(17)

____(18) Writing. Please circle those who provided the inservice training.(18)

Hardware and/or Software Vendors (IBM, Jostens, WICAT, Lego Logo, etc.)[1] District Personnel[2] Other Teachers[3]

University Faculty[4] Other (describe) _____[5]

(continued)

9. How many hours of inservice training associated with ETI in each of the following subjects have you attended since September 1990?

____(20) Reading. Please circle those who provided the inservice training.(21)

Hardware and/or Software Vendors (IBM, Jostens, WICAT, Lego Logo, etc.)[1] District Personnel[2] Other Teachers[3]

University Faculty[4] Other (describe) _____[5]

____(22) Mathematics. Please circle those who provided the inservice training.(23)

Hardware and/or Software Vendors (IBM, Jostens, WICAT, Lego Logo, etc.)[1] District Personnel[2] Other Teachers[3]

University Faculty[4] Other (describe) _____[5]

Please use this scale to answer questions 10 and 11. Write your answers on the line to the left of each answer.

1	2	3	4	5
Not Effective	**Somewhat Effective**	**Effective**	**Strongly Effective**	**Extremely Effective**

10. In general, how effective was the ETI inservice training you experienced in the following subject areas?
(If you did not receive training in one or more of the following subject areas, write NA on the appropriate line(s).)

____(24) Writing ____(25) Reading ____(26) Mathematics

11. Specifically, how effective was the ETI inservice training in each of the following areas?
(If the training did not focus on one or more of these areas, write NA on the appropriate line(s).)

____(27) teaching you to learn what you needed to operate competently technologies purchased with ETI funds?

____(28) giving you concrete ideas about integrating technology into your curriculum?

____(29) giving you the time you needed to plan lessons that integrated technology?

____(30) helping you to better teach higher order thinking skills?

____(31) helping you establish a technology support group among the teachers at your school?

____(32) identifying resources you could call on to continue learning about technology?

____(33) left you with the desire to learn more about and do more with technology?

____(34) helping you to better teach basic skills?

Please use the following scale to answer questions 12 and 13. Write your answers on the line to the left of each answer.

0	1	2	3	4	5
Never	**About once a month or less**	**Two or three times a month**	**About once a week**	**Once or twice a week**	**Three times a week or more**

12. During the current school year (1991-1992), how often have you used each of the following kinds of equipment?

_____(35) Integrated Learning System (e.g., Wicat, IBM TLC, etc.)
_____(36) Computer Lab
_____(37) Computers in your classroom
_____(38) C D ROM
_____(39) Laserdisc player
_____(40) Multi-media
_____(41) Modem
_____(42) Scanner
_____(43) Fileserver for network communications
_____(44) Other (describe) _____

13. Teachers use technology in many different ways and for a variety of reasons. How often have ***you personally*** used technology in each of the following ways during the current (1991-1992) school year?

_____(45) For drill and practice
_____(46) For testing
_____(47) For games
_____(48) For simulations
_____(49) For enrichment activities
_____(50) For review or remediation
_____(51) To support Utah Core Curriculum
_____(52) To meet district/school learning objectives
_____(53) For grading/record keeping
_____(54) To provide higher-order thinking
_____(55) To enhance student creativity
_____(56) As a reward for completing assignments
_____(57) To introduce new concepts
_____(58) To make visual presentations (electronic chalkboard)
_____(59) For word processing
_____(60) As a telecommunications tool to access computer bulletin boards, data bases, or other teachers
_____(61) For keyboarding
_____(62) Other (describe)_____

14. During the current (1991-1992) school year, in which of the following ways have you used technology for instructional purposes in your classroom or in a computer lab ***at least once a week***? (Please circle all that apply.)(63)

I have not used technology once a week [0] | Whole class instruction[1] | Small group work[2] | Individual work[3] | Other (describe)_____ _____[4]

Please use the following scale for questions 15 and 16. Write your answers on the line to the left of each answer.

1	2	3	4	5
Very Negative Impact	**Negative Impact**	**No Impact**	**Positive Impact**	**Extremely Positive Impact**

15. Overall, what has been the impact of technology on most of your students':

_____(64) Cooperation with other students
_____(65) Classroom behavior
_____(66) Subject matter learning
_____(67) Interest in subject matter
_____(68) Problem-solving skills
_____(69) Interest in technology

16. Overall, what effect do you think technology has had on ***you personally*** in each of the following ways:

_____(70) Your interest in teaching
_____(71) Your interactions with other teachers
_____(72) Your self-confidence as a teacher
_____(73) Your efficiency and organization in lesson planning, grading, record keeping
_____(74) Your feelings of professionalism
_____(75) Your instructional effectiveness
_____(76) Your interest in technology
_____(77) Your workload
_____(78) Other _____

Please use the following scale for question 17. Write your answers on the line to the left of each answer.

1	2	3	4	5
Very Negative Impact	**Negative Impact**	**No Impact**	**Positive Impact**	**Extremely Positive Impact**

17. To what extent has each of the following been a barrier to using technology effectively in the classroom?

_____(79) Your lack of knowledge about the technology

_____(80) Your lack of confidence in how to use the technology

_____(81) Insufficient or poor instruction in how to use the technology

_____(82) Logistics of training (e.g. scheduling, location)

_____(83) Insufficient time to learn more about the technology

_____(84) Your lack of interest

_____(85) Inadequate access to hardware or software (e.g., not enough computers or laser disc players; or inability to get them when needed)

_____(86) Hardware unreliable or not set up appropriately

_____(87) Poor or inappropriate software

_____(88) Physical facilities (e.g., space, location of electrical outlets, etc.)

_____(89) Insufficient administrative support

_____(90) Insufficient adult supervision during student use

_____(91) Insufficient time to develop effective uses of technology

_____(92) Difficulty fitting use of technology into curricular/instructional objectives

18. Who ***initiated*** the ETI Project at your school?(93)

Teachers[1] Principal[2] Teachers & Principal[3] District Administration[4]

19. Comments or things we should know but haven't asked:(94)
[1 - 9]

That's It! Thanks for your help!

SOE 03-26-2623-15

Utah Educational Technology Initiative (ETI) Evaluation

Teacher Questionnaire *Grades 3-4*

The purpose of this questionnaire is to gather the perceptions of teachers involved in ETI about project functioning and technology use at their schools. We know that many projects are just beginning, and may not have accomplished as much as they will in the future. Please use this questionnaire to establish a baseline against which future project activities and accomplishments can be measured. We will ask for your perceptions of project functioning again next year.

1. School name _____(11) District _____(12) State Directory School Number _____ - _____(1)

2. School address _____(13) Phone # _____(14)

3. How many years have you been a teacher? _____(2) What grade level do you teach?_____(3)

4. How many years have you taught the grade level or subject(s) you are teaching now? _____(4)

5. Circle which of the following best describes your school:(5)

   Elementary[1] Other (describe) _____(7)

6. About how many hours per week have you typically used technology for ***instructional purposes*** in each of the following years:

_____(7)	_____(8)	_____(9)
1989-1990 (Before ETI)	1990-1991 (last year)	1991-1992 (this year)

7. Do you *regularly* use computer technology for:

   Writing Instruction?(10) NO[1] YES[2] (circle one) Math Instruction?(12) NO[1] YES[2] (circle one)

   Reading Instruction?(11) NO[1] YES[2] (circle one) Other Instruction?(13) NO[1] YES[2] (circle one)

Please use this scale to answer question 8. Write your answers on the line to the left of each answer.

1	2	3	4	5
Not Effective	**Somewhat Effective**	**Effective**	**Strongly Effective**	**Extremely Effective**

8. How effective do you believe computers can be in supporting the teaching of the following subjects:

____(14) Writing. Why? (If possible, give an example)(15)

What software programs are you using to support writing instruction?(16)

____(15) Reading. Why? (If possible, give an example)(17)

What software programs are you using to support reading instruction?(18)

____(16) Mathematics. Why? (If possible, give an example)(19)

What software programs are you using to support mathematics instruction?(110)

9. How many hours of inservice training associated with ETI in each of the following subjects have you attended since September 1990? (If you have not attended any inservice training, circle NA, and skip to question 13.) NA(17)

____(18) Writing. Please circle those who provided the inservice training.(19)

Hardware and/or Software Vendors (IBM, Jostens, WICAT, Lego Logo, etc.)[1] District Personnel[2] Other Teachers[3]

University Faculty[4] Other (describe) _____[5]

(continued)

9 How many hours of inservice training associated with ETI in each of the following subjects have you attended since September 1990?

____(20) Reading. Please circle those who provided the inservice training.(21)

Hardware and/or Software Vendors (IBM, Jostens, WICAT, Lego Logo, etc.)[1] District Personnel[2] Other Teachers[3]

University Faculty[4] Other (describe) _____[5]

____(22) Mathematics. Please circle those who provided the inservice training.(23)

Hardware and/or Software Vendors (IBM, Jostens, WICAT, Lego Logo, etc.)[1] District Personnel[2] Other Teachers[3]

University Faculty[4] Other (describe)_____[5]

Please use this scale to answer questions 10 and 11. Write your answers on the line to the left of each answer.

1	2	3	4	5
Not Effective	**Somewhat Effective**	**Effective**	**Strongly Effective**	**Extremely Effective**

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(If you did not receive training in one or more of the following subject areas, write NA on the appropriate line(s).)

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11 Specifically, how effective was the ETI inservice training in each of the following areas?
(If the training did not focus on one or more of these areas, write NA on the appropriate line(s).)

____(27) teaching you to learn what you needed to operate competently technologies purchased with ETI funds?

____(28) giving you concrete ideas about integrating technology into your curriculum?

____(29) giving you the time you needed to plan lessons that integrated technology?

____(30) helping you to better teach higher order thinking skills?

____(31) helping you establish a technology support group among the teachers at your school?

____(32) identifying resources you could call on to continue learning about technology?

____(33) left you with the desire to learn more about and do more with technology?

____(34) helping you to better teach basic skills?

Please use the following scale to answer questions 12 and 13. Write your answers on the line to the left of each answer.

0	1	2	3	4	5
Never	**About once a month or less**	**Two or three times a month**	**About once a week**	**Once or twice a week**	**Three times a week or more**

12. During the current school year (1991-1992), how often have you used each of the following kinds of equipment?

_____(35) Integrated Learning System (e.g., Wicat, IBM TLC, etc.)

_____(36) Computer Lab

_____(37) Computers in your classroom

_____(38) C D ROM

_____(39) Laserdisc player

_____(40) Multi-media

_____(41) Modem

_____(42) Scanner

_____(43) Fileserver for network communications

_____(44) Other (describe) _____

13. Teachers use technology in many different ways and for a variety of reasons. How often have ***you personally*** used technology in each of the following ways during the current (1991-1992) school year?

_____(45) For drill and practice

_____(46) For testing

_____(47) For games

_____(48) For simulations

_____(49) For enrichment activities

_____(50) For review or remediation

_____(51) To support Utah Core Curriculum

_____(52) To meet district/school learning objectives

_____(53) For grading/record keeping

_____(54) To provide higher-order thinking

_____(55) To enhance student creativity

_____(56) As a reward for completing assignments

_____(57) To introduce new concepts

_____(58) To make visual presentations (electronic chalkboard)

_____(59) For word processing

_____(60) As a telecommunications tool to access computer bulletin boards, data bases, or other teachers

_____(61) For keyboarding

_____(62) Other (describe) _____

14. During the current (1991-1992) school year, in which of the following ways have you used technology for instructional purposes in your classroom or *in a computer lab* ***at least once a week***? (Please circle all that apply.)(62)

I have not used technology once a week [0] | Whole class instruction[1] | Small group work[2] | Individual work[3] | Other (describe)_____ [4]

Please use the following scale for questions 15 and 16. Write your answers on the line to the left of each answer.

1	2	3	4	5
Very Negative Impact	**Negative Impact**	**No Impact**	**Positive Impact**	**Extremely Positive Impact**

15. Overall, what has been the impact of technology on most of your students':

____(64) Cooperation with other students

____(65) Classroom behavior

____(66) Subject matter learning

____(67) Interest in subject matter

____(68) Problem-solving skills

____(69) Interest in technology

16. Overall, what effect do you think technology has had on ***you personally*** in each of the following ways:

____(70) Your interest in teaching

____(71) Your interactions with other teachers

____(72) Your self-confidence as a teacher

____(73) Your efficiency and organization in lesson planning, grading, record keeping

____(74) Your feelings of professionalism

____(75) Your instructional effectiveness

____(76) Your interest in technology

____(77) Your workload

____(78) Other _____

Please use the following scale for question 17. Write your answers on the line to the left of each answer.

1	2	3	4	5
Very Negative Impact	**Negative Impact**	**No Impact**	**Positive Impact**	**Extremely Positive Impact**

17. To what extent has each of the following been a barrier to using technology effectively in the classroom?

_____(79) Your lack of knowledge about the technology

_____(80) Your lack of confidence in how to use the technology

_____(81) Insufficient or poor instruction in how to use the technology

_____(82) Logistics of training (e.g. scheduling, location)

_____(83) Insufficient time to learn more about the technology

_____(84) Your lack of interest

_____(85) Inadequate access to hardware or software (e.g., not enough computers or laser disc players; or inability to get them when needed)

_____(86) Hardware unreliable or not set up appropriately

_____(87) Poor or inappropriate software

_____(88) Physical facilities (e.g., space, location of electrical outlets, etc.)

_____(89) Insufficient administrative support

_____(90) Insufficient adult supervision during student use

_____(91) Insufficient time to develop effective uses of technology

_____(92) Difficulty fitting use of technology into curricular/instructional objectives

18. Who ***initiated*** the ETI Project at your school?(93)

Teachers[1] Principal[2] Teachers & Principal[3] District Administration[4]

19. Comments or things we should know but haven't asked:(94)
[1-9]

That's It! Thanks for your help!

SOE 03-26-2623-15

Utah Educational Technology Initiative (ETI) Evaluation

Teacher Questionnaire *Grades 5-8*

The purpose of this questionnaire is to gather the perceptions of teachers involved in ETI about project functioning and technology use at their schools. We know that many projects are just beginning, and may not have accomplished as much as they will in the future. Please use this questionnaire to establish a baseline against which future project activities and accomplishments can be measured. We will ask for your perceptions of project functioning again next year.

1. School name _____(1-1) District _____(1-2) State Directory School Number _____ - _____(1)

2. School address _____(1-3) Phone # _____(1-4)

3. How many years have you been a teacher? _____(2) What grade level do you teach?_____(3)

4. How many years have you taught the grade level or subject(s) you are teaching now? _____(4)

5. Circle which of the following best describes your school:(5)

   Elementary[1] Middle School[2] Junior High School[3] High School (grades 6-12)[4] High School (grades 9-12)[5]

   High School (grades 10-12)[6] Other (describe) _____[7]

6. If you do not teach in a self-contained classroom, please circle one of the following subjects to indicate your primary teaching category:(6)

   English[1] Math[2] Other (describe) _____[3]

7. About how many hours per week have you typically used technology for ***instructional purposes*** in each of the following years:

_____(7)	_____(8)	_____(9)
1989-1990 (Before ETI)	1990-1991 (last year)	1991-1992 (this year)

8. Do you *regularly* use computer technology for:

   Writing Instruction?(10) NO[1] YES[2] (circle one) Math Instruction?(12) NO[1] YES[2] (circle one)

   Reading Instruction?(11) NO[1] YES[2] (circle one) Other Instruction?(13) NO[1] YES[2] (circle one)

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Please use this scale to answer question 9. Write your answers on the line to the left of each answer.

1	2	3	4	5
Not Effective	**Somewhat Effective**	**Effective**	**Strongly Effective**	**Extremely Effective**

9. How effective do you believe computers can be in supporting the teaching of the following subjects:

____(14)Writing. Why? (If possible, give an example)(15)

What software programs are you using to support writing instruction?(16)

____(15)Reading. Why? (If possible, give an example)(17)

What software programs are you using to support reading instruction?(18)

____(16)Mathematics. Why? (If possible, give an example)(19)

What software programs are you using to support mathematics instruction?(1-10)

10. How many hours of inservice training associated with ETI in each of the following subjects have you attended since September 1990? (If you have not attended any inservice training, circle NA, and skip to question 13.) NA(17)

____(18)Writing. Please circle those who provided the inservice training.(19)

Hardware and/or Software Vendors (IBM, Jostens, WICAT, Lego Logo, etc.)[1] District Personnel[2] Other Teachers[3]

University Faculty[4] Other (describe) _____[5]

(continued)

10. How many hours of inservice training associated with ETI in each of the following subjects have you attended since September 1990?

____(20) Reading. Please circle those who provided the inservice training.(21)

Hardware and/or Software Vendors (IBM, Jostens, WICAT, Lego Logo, etc.)[1] District Personnel[2] Other Teachers[3]

University Faculty[4] Other (describe) _____[5]

____(22) Mathematics. Please circle those who provided the inservice training.(23)

Hardware and/or Software Vendors (IBM, Jostens, WICAT, Lego Logo, etc.)[1] District Personnel[2] Other Teachers[3]

University Faculty[4] Other (describe) _____[5]

Please use this scale to answer questions 11 and 12. Write your answers on the line to the left of each answer.

1	2	3	4	5
Not Effective	**Somewhat Effective**	**Effective**	**Strongly Effective**	**Extremely Effective**

11. In general, how effective was the ETI inservice training you experienced in the following subject areas?
(If you did not receive training in one or more of the following subject areas, write NA on the appropriate line(s).)

____(24) Writing ____(25) Reading ____(26) Mathematics

12. Specifically, how effective was the ETI inservice training in each of the following areas?
(If the training did not focus on one or more of these areas, write NA on the appropriate line(s).)

____(27) teaching you to learn what you needed to operate competently technologies purchased with ETI funds?

____(28) giving you concrete ideas about integrating technology into your curriculum?

____(29) giving you the time you needed to plan lessons that integrated technology?

____(30) helping you to better teach higher order thinking skills?

____(31) helping you establish a technology support group among the teachers at your school?

____(32) identifying resources you could call on to continue learning about technology?

____(33) left you with the desire to learn more about and do more with technology?

____(34) helping you to better teach basic skills?

Please use the following scale to answer questions 13 and 14. Write your answers on the line to the left of each answer.

0	1	2	3	4	5
Never	**About once a month or less**	**Two or three times a month**	**About once a week**	**Once or twice a week**	**Three times a week or more**

13 During the current school year (1991-1992), how often have you used each of the following kinds of equipment?

____(36) Integrated Learning System (e.g., Wicat, IBM TLC, etc.)
____(37) Computer Lab
____(38) Computers in your classroom
____(39) C D ROM
____(40) Laserdisc player
____(42) Multi-media
____(41) Modem
____(42) Scanner
____(43) Fileserver for network communications
____(44) Other (describe) _____

14 Teachers use technology in many different ways and for a variety of reasons. How often have ***you personally*** used technology in each of the following ways during the current (1991-1992) school year?

____(45) For drill and practice
____(46) For testing
____(47) For games
____(48) For simulations
____(49) For enrichment activities
____(50) For review or remediation
____(51) To support Utah Core Curriculum
____(52) To meet district/school learning objectives
____(53) For grading/record keeping
____(54) To provide higher-order thinking
____(55) To enhance student creativity
____(56) As a reward for completing assignments
____(57) To introduce new concepts
____(58) To make visual presentations (electronic chalkboard)
____(59) For word processing
____(60) As a telecommunications tool to access computer bulletin boards, data bases, or other teachers
____(61) For keyboarding
____(62) Other (describe)_____

15. During the current (1991-1992) school year, in which of the following ways have you used technology for instructional purposes in your classroom or in a computer lab ***at least once a week***? (Please circle all that apply.)(63)

I have not used technology once a week [0] | Whole class instruction[1] | Small group work[2] | Individual work[3] | Other (describe)_____ _____[4]

Please use the following scale for questions 16 and 17. Write your answers on the line to the left of each answer.

1	2	3	4	5
Very Negative Impact	**Negative Impact**	**No Impact**	**Positive Impact**	**Extremely Positive Impact**

16. Overall, what has been the impact of technology on most of your students':

____(54) Cooperation with other students
____(55) Classroom behavior
____(56) Subject matter learning
____(57) Interest in subject matter
____(58) Problem-solving skills
____(59) Interest in technology

17. Overall, what effect do you think technology has had on ***you personally*** in each of the following ways:

____(70) Your interest in teaching
____(71) Your interactions with other teachers
____(72) Your self-confidence as a teacher
____(73) Your efficiency and organization in lesson planning, grading, record keeping
____(74) Your feelings of professionalism
____(75) Your instructional effectiveness
____(76) Your interest in technology
____(77) Your workload
____(78) Other _____

Please use the following scale for question 18. Write your answers on the line to the left of each answer.

1	2	3	4	5
Very Negative Impact	**Negative Impact**	**No Impact**	**Positive Impact**	**Extremely Positive Impact**

18. To what extent has each of the following been a barrier to using technology effectively in the classroom?

_____(79) Your lack of knowledge about the technology

_____(80) Your lack of confidence in how to use the technology

_____(81) Insufficient or poor instruction in how to use the technology

_____(82) Logistics of training (e.g. scheduling, location)

_____(83) Insufficient time to learn more about the technology

_____(84) Your lack of interest

_____(85) Inadequate access to hardware or software (e.g., not enough computers or laser disc players; or inability to get them when needed)

_____(86) Hardware unreliable or not set up appropriately

_____(87) Poor or inappropriate software

_____(88) Physical facilities (e.g., space, location of electrical outlets, etc.)

_____(89) Insufficient administrative support

_____(90) Insufficient adult supervision during student use

_____(91) Insufficient time to develop effective uses of technology

_____(92) Difficulty fitting use of technology into curricular/instructional objectives

19. Who ***initiated*** the ETI Project at your school?(93)

Teachers[1] Principal[2] Teachers & Principal[3] District Administration[4]

20. Comments or things we should know but haven't asked:(94)
[1-9]

That's It! Thanks for your help!

SOE 03-26-2623-15

Utah Educational Technology Initiative (ETI) Evaluation

Teacher Questionnaire *Grades 9-10*

The purpose of this questionnaire is to gather the perceptions of teachers involved in ETI about project functioning and technology use at their schools. We know that many projects are just beginning, and may not have accomplished as much as they will in the future. Please use this questionnaire to establish a baseline against which future project activities and accomplishments can be measured. We will ask for your perceptions of project functioning again next year.

1. School name _____(1-1) District _____(1-2) State Directory School Number _____ - _____(1)

2. School address _____(1-3) Phone # _____(1-4)

3. How many years have you been a teacher? _____(2) What grade level do you teach?_____(3)

4. How many years have you taught the grade level or subject(s) you are teaching now? _____(4)

5. Circle which of the following best describes your school:(5)

   Junior High School[3] High School (grades 6-12)[4] High School (grades 9-12)[5] High School (grades 10-12)[6]

   Other (describe) _____(7)

6. About how many hours per week have you typically used technology for ***instructional purposes*** in each of the following years:

_____(7)	_____(8)	_____(9)
1989-1990	1990-1991	1991-1992
(Before ETI)	(last year)	(this year)

7. Do you *regularly* use computer technology for:

   Writing Instruction?(10) NO[1] YES[2] (circle one) Math Instruction?(12) NO[1] YES[2] (circle one)

   Reading Instruction?(11) NO[1] YES[2] (circle one) Other Instruction?(13) NO[1] YES[2] (circle one)

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Please use this scale to answer question 8. Write your answers on the line to the left of each answer.

1	2	3	4	5
Not Effective	**Somewhat Effective**	**Effective**	**Strongly Effective**	**Extremely Effective**

8. How effective do you believe computers can be in supporting the teaching of the following subjects:

_____(14) Writing. Why? (If possible, give an example)(1-5)

What software programs are you using to support writing instruction?(1-6)

_____(15) Reading. Why? (If possible, give an example)(1-7)

What software programs are you using to support reading instruction?(1-8)

_____(16) Mathematics. Why? (If possible, give an example)(1-9)

What software programs are you using to support mathematics instruction?(1-10)

9. How many hours of inservice training associated with ETI in each of the following subjects have you attended since September 1990? (If you have not attended any inservice training, circle NA, and skip to question 13.) NA(17)

_____(18) Writing. Please circle those who provided the inservice training.(19)

Hardware and/or Software Vendors (IBM, Jostens, WICAT, Lego Logo, etc.)[1] District Personnel[2] Other Teachers[3]

University Faculty[4] Other (describe) _____[5]

(continued)

9. How many hours of inservice training associated with ETI in each of the following subjects have you attended since September 1990?

____(20) Reading. Please circle those who provided the inservice training.(21)

Hardware and/or Software Vendors (IBM, Jostens, WICAT, Lego Logo, etc.)[1] District Personnel[2] Other Teachers[3]

University Faculty[4] Other (describe) _____[5]

____(22) Mathematics. Please circle those who provided the inservice training.(23)

Hardware and/or Software Vendors (IBM, Jostens, WICAT, Lego Logo, etc.)[1] District Personnel[2] Other Teachers[3]

University Faculty[4] Other (describe) _____[5]

Please use this scale to answer questions 10 and 11. Write your answers on the line to the left of each answer.

1	2	3	4	5
Not Effective	**Somewhat Effective**	**Effective**	**Strongly Effective**	**Extremely Effective**

10. In general, how effective was the ETI inservice training you experienced in the following subject areas?
(If you did not receive training in one or more of the following subject areas, write NA on the appropriate line(s).)

____(24) Writing ____(25) Reading ____(26) Mathematics

11. Specifically, how effective was the ETI inservice training in each of the following areas?
(If the training did not focus on one or more of these areas, write NA on the appropriate line(s).)

____(27) teaching you to learn what you needed to operate competently technologies purchased with ETI funds?

____(28) giving you concrete ideas about integrating technology into your curriculum?

____(29) giving you the time you needed to plan lessons that integrated technology?

____(30) helping you to better teach higher order thinking skills?

____(31) helping you establish a technology support group among the teachers at your school?

____(32) identifying resources you could call on to continue learning about technology?

____(33) left you with the desire to learn more about and do more with technology?

____(34) helping you to better teach basic skills?

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Please use the following scale to answer questions 12 and 13. Write your answers on the line to the left of each answer.

0	1	2	3	4	5
Never	**About once a month or less**	**Two or three times a month**	**About once a week**	**Once or twice a week**	**Three times a week or more**

12. During the current school year (1991-1992), how often have you used each of the following kinds of equipment?

_____(35) Integrated Learning System (e.g., Wicat, IBM TLC, etc.)
_____(36) Computer Lab
_____(37) Computers in your classroom
_____(38) C D ROM
_____(39) Laserdisc player
_____(40) Multi-media
_____(41) Modem
_____(42) Scanner
_____(43) Fileserver for network communications
_____(44) Other (describe) _____

13. Teachers use technology in many different ways and for a variety of reasons. How often have ***you personally*** used technology in each of the following ways during the current (1991-1992) school year?

_____(45) For drill and practice
_____(46) For testing
_____(47) For games
_____(48) For simulations
_____(49) For enrichment activities
_____(50) For review or remediation
_____(51) To support Utah Core Curriculum
_____(52) To meet district/school learning objectives
_____(53) For grading/record keeping
_____(54) To provide higher-order thinking
_____(55) To enhance student creativity
_____(56) As a reward for completing assignments
_____(57) To introduce new concepts
_____(58) To make visual presentations (electronic chalkboard)
_____(59) For word processing
_____(60) As a telecommunications tool to access computer bulletin boards, data bases, or other teachers
_____(61) For keyboarding
_____(62) Other (describe)_____

14 During the current (1991-1992) school year, in which of the following ways have you used technology for instructional purposes in your classroom or in a computer lab ***at least once a week***? (Please circle all that apply.)(63)

I have not used technology once a week [0] | Whole class instruction[1] | Small group work[2] | Individual work[3] | Other (describe)_____ _____[4]

Please use the following scale for questions 15 and 16. Write your answers on the line to the left of each answer.

1	2	3	4	5
Very Negative Impact	**Negative Impact**	**No Impact**	**Positive Impact**	**Extremely Positve Impact**

15 Overall, what has been the impact of technology on most of your students':

____(64) Cooperation with other students
____(65) Classroom behavior
____(66) Subject matter learning
____(67) Interest in subject matter
____(68) Problem-solving skills
____(69) Interest in technology

16 Overall, what effect do you think technology has had on ***you personally*** in each of the following ways:

____(70) Your interest in teaching
____(71) Your interactions with other teachers
____(72) Your self-confidence as a teacher
____(73) Your efficiency and organization in lesson planning, grading, record keeping
____(74) Your feelings of professionalism
____(75) Your instructional effectiveness
____(76) Your interest in technology
____(77) Your workload
____(78) Other _____

Please use the following scale for question 17. Write your answers on the line to the left of each answer.

1	2	3	4	5
Very Negative Impact	**Negative Impact**	**No Impact**	**Positive Impact**	**Extremely Positive Impact**

17. To what extent has each of the following been a barrier to using technology effectively in the classroom?

_____(79) Your lack of knowledge about the technology

_____(80) Your lack of confidence in how to use the technology

_____(81) Insufficient or poor instruction in how to use the technology

_____(82) Logistics of training (e.g. scheduling, location)

_____(83) Insufficient time to learn more about the technology

_____(84) Your lack of interest

_____(85) Inadequate access to hardware or software (e.g., not enough computers or laser disc players; or inability to get them when needed)

_____(86) Hardware unreliable or not set up appropriately

_____(87) Poor or inappropriate software

_____(88) Physical facilities (e.g., space, location of electrical outlets, etc.)

_____(89) Insufficient administrative support

_____(90) Insufficient adult supervision during student use

_____(91) Insufficient time to develop effective uses of technology

_____(92) Difficulty fitting use of technology into curricular/instructional objectives

18. Who ***initiated*** the ETI Project at your school?(93)

Teachers[1] Principal[2] Teachers & Principal[3] District Administration[4]

19. Comments or things we should know but haven't asked:(94)
[1 - 9]

That's It! Thanks for your help!

SOE 03-26-2623-15

Utah Educational Technology Initiative (ETI) Evaluation

Teacher Questionnaire *Grades 11-12*

The purpose of this questionnaire is to gather the perceptions of teachers involved in ETI about project functioning and technology use at their schools. We know that many projects are just beginning, and may not have accomplished as much as they will in the future. Please use this questionnaire to establish a baseline against which future project activities and accomplishments can be measured. We will ask for your perceptions of project functioning again next year.

1. School name _____(1-1) District _____(1-2) State Directory School Number _____ - _____(1)

2. School address _____(1-3) Phone # _____(1-4)

3. How many years have you been a teacher? _____(2) What grade level do you teach?_____(3)

4. How many years have you taught the grade level or subject(s) you are teaching now? _____(4)

5. Circle which of the following best describes your school:(5)

   Junior High School(3) High School (grades 6-12)(4) High School (grades 9-12)(5) High School (grades 10-12)(6)

   Other (describe) _____(7)

6. About how many hours per week have you typically used technology for *instructional purposes* in each of the following years:

_____(7)	_____(8)	_____(9)
1989-1990 (Before ETI)	1990-1991 (last year)	1991-1992 (this year)

7. Do you *regularly* use computer technology for:

   Writing Instruction?(10) NO(1) YES(2) (circle one) Math Instruction?(12) NO(1) YES(2) (circle one)

   Reading Instruction?(11) NO(1) YES(2) (circle one) Other Instruction?(13) NO(1) YES(2) (circle one)

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Please use this scale to answer question 8. Write your answers on the line to the left of each answer.

1	2	3	4	5
Not Effective	**Somewhat Effective**	**Effective**	**Strongly Effective**	**Extremely Effective**

8. How effective do you believe computers can be in supporting the teaching of the following subjects:

____(14)Writing. Why? (If possible, give an example)(1-5)

What software programs are you using to support writing instruction?(1-6)

____(15)Reading. Why? (If possible, give an example)(1-7)

What software programs are you using to support reading instruction?(1-8)

____(16)Mathematics. Why? (If possible, give an example)(1-9)

What software programs are you using to support mathematics instruction?(1-10)

9. How many hours of inservice training associated with ETI in each of the following subjects have you attended since September 1990? (If you have not attended any inservice training, circle NA, and skip to question 13.) NA(17)

____(18)Writing. Please circle those who provided the inservice training.(19)

Hardware and/or Software Vendors (IBM, Jostens, WICAT, Lego Logo, etc.)[1] District Personnel[2] Other Teachers[3]

University Faculty[4] Other (describe) _____[5]

(continued)

9. How many hours of inservice training associated with ETI in each of the following subjects have you attended since September 1990?

_____(20) Reading. Please circle those who provided the inservice training.(21)

Hardware and/or Software Vendors (IBM, Jostens, WICAT, Lego Logo, etc.)[1] District Personnel[2] Other Teachers[3]

University Faculty[4] Other (describe) _____[5]

_____(22) Mathematics. Please circle those who provided the inservice training.(23)

Hardware and/or Software Vendors (IBM, Jostens, WICAT, Lego Logo, etc.)[1] District Personnel[2] Other Teachers[3]

University Faculty[4] Other (describe) _____[5]

Please use this scale to answer questions 10 and 11. Write your answers on the line to the left of each answer.

1	2	3	4	5
Not Effective	**Somewhat Effective**	**Effective**	**Strongly Effective**	**Extremely Effective**

10. In general, how effective was the ETI inservice training you experienced in the following subject areas?
(If you did not receive training in one or more of the following subject areas, write NA on the appropriate line(s).)

_____(24) Writing _____(25) Reading _____(26) Mathematics

11. Specifically, how effective was the ETI inservice training in each of the following areas?
(If the training did not focus on one or more of these areas, write NA on the appropriate line(s).)

_____(27) teaching you to learn what you needed to operate competently technologies purchased with ETI funds?

_____(28) giving you concrete ideas about integrating technology into your curriculum?

_____(29) giving you the time you needed to plan lessons that integrated technology?

_____(30) helping you to better teach higher order thinking skills?

_____(31) helping you establish a technology support group among the teachers at your school?

_____(32) identifying resources you could call on to continue learning about technology?

_____(33) left you with the desire to learn more about and do more with technology?

_____(34) helping you to better teach basic skills?

Please use the following scale to answer questions 12 and 13. Write your answers on the line to the left of each answer.

0	1	2	3	4	5
Never	**About once a month or less**	**Two or three times a month**	**About once a week**	**Once or twice a week**	**Three times a week or more**

12. During the current school year (1991-1992), how often have you used each of the following kinds of equipment?

_____(35) Integrated Learning System (e.g., Wicat, IBM TLC, etc.)

_____(36) Computer Lab

_____(37) Computers in your classroom

_____(38) C D ROM

_____(39) Laserdisc player

_____(40) Multi-media

_____(41) Modem

_____(42) Scanner

_____(43) Fileserver for network communications

_____(44) Other (describe) _____

13. Teachers use technology in many different ways and for a variety of reasons. How often have ***you personally*** used technology in each of the following ways during the current (1991-1992) school year?

_____(45) For drill and practice

_____(46) For testing

_____(47) For games

_____(48) For simulations

_____(49) For enrichment activities

_____(50) For review or remediation

_____(51) To support Utah Core Curriculum

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_____(52) To meet district/school learning objectives

_____(53) For grading/record keeping

_____(54) To provide higher-order thinking

_____(55) To enhance student creativity

_____(56) As a reward for completing assignments

_____(57) To introduce new concepts

_____(58) To make visual presentations (electronic chalkboard)

_____(59) For word processing

_____(60) As a telecommunications tool to access computer bulletin boards, data bases, or other teachers

_____(61) For keyboarding

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_____(62) Other (describe)_____

14. During the current (1991-1992) school year, in which of the following ways have you used technology for instructional purposes in your classroom or in a computer lab ***at least once a week***? (Please circle all that apply.)(63)

I have not used technology once a week [0] | Whole class instruction[1] | Small group work[2] | Individual work[3] | Other (describe)_____ [4]

Please use the following scale for questions 15 and 16. Write your answers on the line to the left of each answer.

1	2	3	4	5
Very Negative Impact	**Negative Impact**	**No Impact**	**Positive Impact**	**Extremely Positve Impact**

15. Overall, what has been the impact of technology on most of your students':

_____(64) Cooperation with other students

_____(65) Classroom behavior

_____(66) Subject matter learning

_____(67) Interest in subject matter

_____(68) Problem-solving skills

_____(69) Interest in technology

16. Overall, what effect do you think technology has had on ***you personally*** in each of the following ways:

_____(70) Your interest in teaching

_____(71) Your interactions with other teachers

_____(72) Your self-confidence as a teacher

_____(73) Your efficiency and organization in lesson planning, grading, record keeping

_____(74) Your feelings of professionalism

_____(75) Your instructional effectiveness

_____(76) Your interest in technology

_____(77) Your workload

_____(78) Other _____

Please use the following scale for question 17. Write your answers on the line to the left of each answer.

1	2	3	4	5
Very Negative Impact	**Negative Impact**	**No Impact**	**Positive Impact**	**Extremely Positive Impact**

17 To what extent has each of the following been a barrier to using technology effectively in the classroom?

_____(79) Your lack of knowledge about the technology

_____(80) Your lack of confidence in how to use the technology

_____(81) Insufficient or poor instruction in how to use the technology

_____(82) Logistics of training (e.g. scheduling, location)

_____(83) Insufficient time to learn more about the technology

_____(84) Your lack of interest

_____(85) Inadequate access to hardware or software (e.g., not enough computers or laser disc players; or inability to get them when needed)

_____(86) Hardware unreliable or not set up appropriately

_____(87) Poor or inappropriate software

_____(88) Physical facilities (e.g., space, location of electrical outlets, etc.)

_____(89) Insufficient administrative support

_____(90) Insufficient adult supervision during student use

_____(91) Insufficient time to develop effective uses of technology

_____(92) Difficulty fitting use of technology into curricular/instructional objectives

18 Who ***initiated*** the ETI Project at your school?(93)

Teachers[1] Principal[2] Teachers & Principal[3] District Administration[4]

19 Comments or things we should know but haven't asked:(94)

[1-9]

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That's It! Thanks for your help!

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